SCIENCE

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FRIDAY, MAY 25, 1900.

CONTENTS:

SHOULD LATIN AND GREEK BE REQUIRED FOR THE DEGREE OF BACHELOR OF ARTS?

THE removal of Latin from the curriculum required for A. B. by another prominent university has re-opened discussion respecting the relative worth of classical and other studies. The discussion is conducted much in the same manner as of old and disputants on both sides frequently show irritation when the opposing opinion is expressed. They seem to regard the matter as so thoroughly settled that all doubts can be disposed of by a wave of the hand. But the matters involved deserve very different treatment from this. There must be something worth considering on both sides, otherwise intelligent men would not be ranged in opposing camps. The writer will endeaver to present one side of the case.

One point should be noted at the outset. It must be evident to those who have followed the discussion during late years that the contestants are not equally competent to render judgment. Most of those who resist encroachment upon territory, held so long by the older system, and who deny that inductive sciences can be utilized as culture studies are unfamiliar with science and cannot distinguish between pure and applied science. Their reading has been determined by their college training, or their studies have been confined within

somewhat narrow limits by professional surroundings. Their knowledge of chemistry and physics is bounded by the curriculum of thirty or more years ago in the larger colleges or by that of some of the younger institutions with limited resources; while their knowledge of biology, geology and modern psychology has been derived from magazine articles, popular summaries or from controversial works of not wholly friendly character.

American workers in pure science, who have passed middle age were trained, with few exceptions, in the studies of the old curriculum, so that they understand thoroughly its nature and its advantages. But the exigencies of their work have compelled them to recognize the deficiencies also. The great majority of those laboring in pure science have a working knowledge of French, German, and Italian and many add Spanish and Russian; some require in addition a good knowledge of the oriental languages as well as of numerous dialects —in every case a knowledge much more exact than the knowledge of Greek and Latin possessed by the ordinary college graduate; and all of this merely as preparation for their work. Such study necessarily brings men into touch with a great range of knowledge, so that, especially among naturalists, many are well read in various branches of philosophy and almost all have a broad acquaintance with literature. These are the men who assert deliberately that the older system of education is a survival of conditions which men have outgrown and that it is no longer fitted to our needs.

In one sense, education, as training, is an end in itself, being a course in mental gymnastics; but in the true sense it is far more, embracing not merely mental training but also the imparting of knowledge.

In another place, the writer likened the college course to emery used in polishing metal and held that, as one has no concern for the emery after the metal has been polished, so, if the youth be developed, it matters little whether or not his college studies disappear from memory. But this is a narrow view, regarding mere training as the single end, not considering that this strengthening, developing process consumes the years when the power of acquiring and that of retention are most efficient. Those years ought not to be expended in training to the exclusion of learning. Youth in America is shorter now than formerly; manhood's responsibilities come earlier and are heavier; one cannot ignore the utilitarian side of education—utilitarian, not in the sense of dollars and cents but in that of preparing the man for usefulness. There should be more than mere robustness to show for the labor of the early years, some capital should be accumulated with which to utilize the robustness.

Study of classical tongues retained its very prominent place in college curricula long after necessity for it disappeared. Until little more than one hundred years ago, classical languages were studied for use—the study was as purely utilitarian in purpose as is that of the Calculus to-day. Latin, as the language of the mediæval church, was the language of educated men until the latter part of the eighteenth century; university lectures were delivered in Latin; scientific, theological and philosophical works were written in it. At the revival of learning, the sources of knowledge were classical and early Christian writers: to reach them, acquaintance with Greek and Latin was essential; those tongues were learned by students at that time as anatomy is learned by the medical student of our time and for the same reason. There were but two learned professions, Law and Theology, with Medicine as a coming third. Education was for the few, to enable them to enter a profession, not to develop them,

not to render them useful. Educated men could not touch commerce—that was degradation. But education now is for all, for the poor as for the rich, for the merchant as for the professional man; we recognize that the professional man ranks no higher intellectually than does the financier, whether the latter deal in money or in goods. This absolute reversal of conditions cannot be ignored in the discussion.

When men threw off the bonds of the mediæval church, the study of things replaced that of words; men discovered themselves and the great world about them. As knowledge increased, respect for the dicta of ancient writers decreased; Latin and Greek fell into disuse and at length necessity for acquaintance with them disappeared. But the curricula had become hoary with age; change meant revolution; the universities were controlled by men who knew no other training and the prominent instructors in almost all branches belonged to the clerical profession. Those investigating material things were spoken of disdainfully; even those studying the physical portion of man received little respect from those who studied his mental and spiritual portion—their work was referred to patronizingly as requiring less intellectual power than that of their critics —a reflection not wholly unknown in our time, for there are still those who appear to think that familiarity with material things unfits a man for taking the higher flights of philosophical reasoning. There may be something in this reflection, for a knowledge of facts cannot fail to fetter the wings of a philosopher of the old type.

When classical study ceased to be necessary from the utilitarian standpoint, those entrusted with educational work discovered that it was still necessary from an educational standpoint. Verily necessity is the mother of invention. Necessity increased with years and for the last half century men have been seeking excuses for retention of compulsory classical study. They have succeeded in convincing those who know little about either classics or science that without such a smattering of the classics as the college man usually receives, no one can be regarded as educated.

The change in purpose brought about a change in the teaching, so that classical instruction, as commonly conducted in secondary schools, leads a youth along an investigation of grammatical principles. The great majority of young men, who enter college after four to six years of preparation, find themselves so burdened by lexicon work that too many of them seek relief in the convenient 'Bohn.' Acquisition of the vocabulary seems to be less important than mastery of nice points in syntax. An eminent instructor in Latin told the writer that in marking students he laid little stress on translation, as a 'Bohn' is always available; his grading was based on proficiency in prose and quantity which had to be studied. That a large proportion of Bachelors, after ten years of study, cannot read their diplomas without resort to a lexicon causes no surprise to them or to their instructors. They had not been attempting to acquire either Latin or Greek, but they had been utilizing classical words and idioms in studying the principles of grammar. True it is, that this statement is not of universal application; there are exceptions among both instructors and students and, owing to the demand that there be something tangible to show for the labor of years, the number is increasing; but the fact remains that the conditions as described are those which prevail; and they have much to do with the notion that the study of classical languages is much more difficult than that of other languages.

But one asks, suppose that the young man has acquired an accurate knowledge of, let us say, Latin, that he can read, write

and speak it, has he gained nothing? He has gained much, he has learned accuracy in expression; a certain discrimination in the use of terms; he has cultivated his memory; he has become acquainted with the tongue in which men of Rome expressed their thoughts; in which many theologians of the early centuries expressed their conceptions of what Christianity ought to be; in which theologians of later centuries expressed their conceptions and misconceptions of what the Fathers wrote; the language of educated men until a little more than one hundred years ago. Thus he has acquired, first, a sharpening of certain faculties and, secondly, the means which give direct access to a great literature representing in time more than two milleniums preceding our century.

This much he has acquired and it certainly is a great deal. Those who defend the necessity for classical training assert that he has acquired much more if he be an English-speaking student. It is said that one has a better understanding of his own tongue if he have a good knowledge of the classics, since so much of our language is derived from the Greek and Latin. Shakespeare, we are told, enriched our vocabulary by the addition of not less than three thousand words.

Much is made of this, but one may doubt the importance of the reasoning. Words are available when they become identified with things either material or abstract, so that one's ability to use them with precision depends upon the exactness of the identification. The question of their origin does not enter into the matter. Indeed, one too fully imbued with the signification of parent-words may employ derived words in senses at variance with accepted significations. If there be any force in the argument, it would apply rather to a course in Anglo-Saxon or in the language of the Authorized Version, if the object be to cultivate a direct style. That Shakespeare's works enriched the English vocabulary admits of no doubt; but if Shakespeare wrote his plays, the argument gains little strength by reference to him, for, according to Ben Jonson, he knew 'little Latin and less Greek.' In any event, however, this is a matter of no importance. The suggestion that our language is in urgent need of further enrichment can hardly commend itself as wise in view of the fact that the lexicons already boast of approximately three hundred thousand words, while the vocabulary of the metropolitan newspaper does not exceed three thousand and that of great writers rarely equals ten thousand.

But conceding all that has been conceded so willingly because true, the query persistently comes: Is the profit in due proportion to the expenditure in time and labor? Might not the mental discipline be acquired equally well by the use of other languages, which would open a wider field of knowledge and render the man more useful to himself and to his fellows?

The modernized courses pay too little attention to instruction in the use of language. The literary courses are better than the older types in that they do not exclude the English language and proper training in that direction is not far away; but the defect is still too conspicuous, especially in the scientific courses. Laboratory work leads to exactness in method; field-work gives precision in observation and comparison; scientific training, in general, strengthens the logical powers and gives precision in thinking; but none of them gives precision in expression. As in theological seminaries, too often, preparation for preaching is neglected on the principle that if a man has anything to say he will find no difficulty in saying it, so the study of language as a means of expressing one's thoughts has been neglected in scientific training. Nevertheless, one cannot fail to

recognize that the writings of scientific men compare, at least, favorably with the writings of those who have had the great advantage of classical training, that is to say, of the average clergymen and lawyer, those who plead so urgently for retention of the system from which they have received such abundant profit. Brilliant rhetoricians cannot be taken as examples of what the training can do—in the intellectual as in the vegetable world, the average of the fruitage, not the choicest selections, must be taken as type of the product. And one must not forget that the soil in which seed is planted has much to do with the crop.

But the remedy for this defect in modern training is very simple, and its application involves no material change in plan.

The advantages derived from education according to the old system do not come from the study of Latin and Greek any more than they would come from the study of French, Hebrew or any other language. The results are due to the method, not in any sense to the particular language employed. One may say, better, that the result is due rather to skill in applying the method, for classical teaching is very different to-day from that of the older day, when pupils were plunged *in medias res* at the outset. The Arnoldian method is not so far removed from the Ollendorfian as a casual observer might imagine. Why then do we hear the constant claim for the advantage of classical teaching?

The reason is found in conditions still existing in our secondary schools. There, the ablest teachers have always been those in classics, though increasing requirements for college entrance have led in many instances to the selection of strong men for mathematics. Until very recently, the study of English has been perfunctory, while, for the most part, French and German have been taught by 'natives' because they alone can give the 'proper pronunciation.' But those excellent men, though efficient teachers for pupils willing to learn, too often fail as disciplinarians and have to pay more attention to quieting disorder than to imparting knowledge. Here must be made the change needed to remedy the defect in our modern system. Men must be employed, who can teach the modern languages as Latin and Greek were taught seventy-five years ago, when the pupil acquired not merely a fairly accurate knowledge of grammatical principles, but also the language itself. Our colleges must demand more thorough preparation in modern languages—in other words, the transformation which college courses have undergone must reach into the secondary schools. Able men occupy modern language chairs in colleges; able teachers must be found to prepare students.

But some may feel that while a modern language course may be as useful mental training as is a classical course, still there may be room for doubt whether or not he has gained equal preparation for his life's work.

If the end to be attained by classical study, beyond mere discipline, is the ability to read the works of those who wrote in classical languages, surely the labor has been that of supererogation, for practically all that is good in the ancient languages, whether theological or legal or literary, has been done into English after a fashion many times better than that of the amateur—and the reading in English will be vastly more profitable than that in the original, for one's contemplation of lofty sentiments or useful matter is not likely to be interrupted by struggles with difficult construction. This argument is treated with such contempt by advocates of elaborate classical study that one is inclined to regard it as unanswerable. It is said, however, that the true meaning of an author cannot be

ascertained from a translation, the work must be read in the original—which is equivalent to saying that, to most of us, works in a foreign language, especially those in a dead language, must remain sealed books. No man can acquire a knowledge of a dead language, so exact as to enable him to think in it, without expending so much labor as to leave time for little else, so that to most of us a conception of what the writers meant must come through translation.

But we may dismiss this last argument, for it is purely academic and has no reference to the actual condition. It is not pretended that the ordinary college graduate knows enough to make the reading of Latin or Greek authors a delight in hours of relaxation from the burdens of everyday life. Long ago, Latin text-books were abandoned in theological seminaries, not so much because the theology was antiquated as because the students were so burdened by translation that neither time nor energy remained for study of the matter.

But granting all that is claimed, the question still recurs, is the game worth the candle? Is access to classical authors in the original or even in translation a matter of such importance to the average man as to justify the expenditure of the most important years of his life? One cannot avoid expressing some doubts respecting this. Unquestionably, the men of classical Greece and Rome were, in some instances, men of towering intellect; those who worship at the classical shrine demand that we point out in modern times the equals of Aristotle, Homer, Thucydides, Plato, Seneca, Vergil, Tacitus, Horace, Quintilian and half a score of others. Where in modern literature, we are asked, can one find such elevating sentiments, such ennobling philosophy, such brilliant rhetoric? One may reply that perspective has much to do with this type of ancestor worship, that a score or even two scores of names gathered from more than a millenium of antiquity could easily be matched by a score of names gathered from the five centuries preceding our own. Even our nineteenth century, whose materialism grieves so many hearts, does not pale in comparison with the golden period of either Greece or Rome. Men do not stand out pre-eminently now as they did centuries ago, for the field of knowledge is so wide and the laborers so numerous that one may gain eminence only with great difficulty in even a very contracted portion. Pre-eminent in his own area, he may be utterly unknown to workers elsewhere. It is probable that the ablest astronomer in America cannot name the most eminent ten chemists in the world and, in like manner, that the ablest chemist cannot name the most eminent ten astronomers. It is equally probable that no eminent philosopher or historian in this country can name the ten Americans who have been pre-eminent in the several branches of science during the last fifty years. If Aristotle were living now, he would be an eminent professor of philosophy in some university, much respected by philosophers elsewhere, but unknown outside of his immediate circle, unless, like Herbert Spencer, he should undertake problems of broad type, in which case, no doubt, he would be as little read and as much misrepresented as Spencer himself.

Of course, one risks much in venturing to question the over-towering grandeur of the ancient writers, for their names have been enshrined so long that doubts respecting their superiority appear as sacrilegious as were Galileo's doubts respecting the Ptolemaic system. But the fact remains, that the commonly accepted verdict in favor of the ancient writers is not that of our day—it was pronounced at the revival of learning amid the shadows of the receding dark ages and it has become a tradition

in seats of learning to be guarded carefully as a pillar of the intellectual universe.

But the student, who has a thorough knowledge of French and German as well as of his own language, still has access through translations to the thoughts of antiquity, while he has vastly more. He has access to the best thoughts of modern times, to the works of authors in all branches of knowledge during this, the age not only of greatest intellectual activity but also of the most accurate investigation. If he be a professional man, he can keep himself abreast with advance; if he have turned aside to commerce, he finds himself equipped for the broader fields; in any case without early training in those languages, he is crippled and is compelled to learn them amid the pressure of other duties. Those languages he must know—without them, he cannot gain admission to graduate schools of our stronger universities. They are as essential as was Latin a century ago and for the same reason—they are, so to speak the tools of trade. In philosophy, law, theology and the various branches of science, a man is at more than serious disadvantage without them.

In all this, there is no denial that a knowledge of Greek and Latin is useful; but that is wholly aside from the issue, which is, whether the gains from the study of classical languages are such as to justify the demand that it retain the very prominent place in the curriculum. The utility of some acquaintance with Latin and Greek is beyond dispute; naturalists employ terms derived from those languages; astronomers and chemists make heavy drafts on mythology, while relics of old practice in law and medicine remain embalmed in Latin terms and phrases. But the knowledge of Greek and Latin necessary to the physician, clergyman or lawyer is not great in quantity; if it were, most of the college graduates who have taken up those professions would feel themselves sadly handicapped. Indeed, a 'smattering' is all that very many energetic writers demand.

Elementary courses in Hebrew, Arabic, Assyrian, Italian and Spanish are given in all of our larger institutions and, in many, the opportunity is still afforded for the beginner in French and German. Similar courses, as options, ought to be offered in Latin and Greek, planned to give a good knowledge of the vocabulary and to acquaint the student with that something, which we are accustomed to call the 'genius' of the language. A faithful student, with an object in view, should be able in two years to read, with comparative ease, any ordinary work in either of those languages. Certainly, no one will assert that Latin and Greek are more difficult than German or that the idioms are more perplexing than those of Spanish. Scientific men understand this, for there are doubtless few who have not been compelled to acquire at short notice a working knowledge of an additional language in order to prosecute an investigation already begun.

When our college curricula shall have been properly adjusted, the graduate will have received the polish obtained by study of language and literature, the logical mode of thought obtained by study of mathematics, the knowledge, strength and judicial tendency obtained by study of the inductive sciences; while in addition, he will have the means to utilize his gains in the profession or calling which has been in view during the later years of his college life.

JOHN J. STEVENSON.

THE BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

IN 1881 Professor R. P. Whitfield saw that the scientific needs of this Museum, its reputation amongst kindred institutions in the world, and its proper recognition of its natural responsibility to the world of

science, as well as the obvious advantages to itself, demanded that some scientific publication should be begun. Publications were commonly considered invariable concomitants of Museum life. The Museum of Comparative Zoology, under Louis Agassiz, began its important series of Bulletins in 1863, and later enlarged the work of investigation by instituting the Memoirs, begun in 1864. The Bulletins were largely at first devoted to systematic work but this was soon gradually invaded and partially displaced by biological studies and such admirable geological and physiographic papers as R. T. Hill's Geology and Physical Geography of Jamaica. A. Agassiz's study of the Fiji Islands and the Three Voyages of the Blake appeared.

The Museum of Comparative Zoology boasted of an extraordinary group of students, and the inception of a bulletin or some other form of publication was inevitable. Here A. E. Verrill, S. H. Scudder, J. A. Allen, Jeffries Wyman, Wm. Stimpson, A. S. Packard, J. G. Anthony, Alpheus Hyatt, W. H. Niles, A. Agassiz, F. W. Putnam, O. St. John, C. F. Hartt, L. F. de Pourtales, Theodore Lyman, P. R. Uhler, U. S. Shaler, Horace Mann, W. H. Dall, A. S. Bickmore were likely, from their superabundant enthusiasm and industry, as well as the unflagging zeal of their leader Louis Agassiz, soon to demand a printed page for their results in various fields of natural science. It is in much more recent years that these splendid publications have been continued on a biological line, by Folsom, Bouvier and Fischer, Mayer, and A. Agassiz, Hamaker, Galloway, Bancroft, Parker, Gerould, Wilcox, Vennings, Meyer, and Neal.

Yet, under the most favorable conditions for the supply of material, the early volumes of the Museum of Comparative Zoology did not equal in size the first Bulletins of the American Museum of Natural History.

The Memoirs of the Museum of Comparative Zoology embodied more elaborate contributions to science in the form of quarto volumes, in which such notable studies as Allman's Hydroids, Agassiz's Echini and Acalephs, Faxon's Stalk-eyed Crustacea appeared.

The Peabody Museum of American Archæology and Ethnology publish Annual Reports embracing some scientific information, miscellaneous papers, and Memoirs. The Peabody Museum of Yale University publishes Memoirs, the Field Museum of Chicago engages in the publication of papers in its various departments. In New York, the Reports of the Regents of the University of the State of New York, on the condition of the State Cabinet of Natural History, had been long established. This last important series had been the depository of scientific papers and afforded an outlet for Professor Hall's paleontological studies which otherwise would have suffered partial suppression. These Reports have been succeeded by the Reports of the Museums, filled with useful and often elaborateand comprehensive treatises on questions in State Geology, Paleontology and Botany.

The Smithsonian Institution and the National Museum have been prolific sources of published material, and the Museums in Europe have issued numerous studies and periodical papers.

It would indeed be very obvious to any thoughtful mind that the Museum could not long maintain a self-respecting attitude towards the world of science, nor bring itself into correlation with its own expectations if it did not have a scientific publication. Besides, there were substantial benefits of another sort to be secured. The Bulletin or whatever other publication was finally decided upon would be the means of bringing the Museum into correspondence with societies, institutes, museums, ly-

ceums, throughout the world, with whom a profitable literary exchange could be at once instituted. The Library would be in this way fed and increased. It is difficult, or impossible, without a very considerable expenditure of money to obtain these publications, but in the wide fraternity of scientific workers, their efforts at different stations to solve scientific questions, is mutually appreciated and instantly required. Thus a scientific commerce with the rest of the world would become established. Then it formed naturally the only way in which the Museum's own possessions could be presented to the scientific world, while the inevitable development of expeditions in connection with the institution could only find, by such an avenue of communication, general recognition. A letter from Professor R. P. Whitfield to President Jesup was written urging the usefulness of a scientific publication.

The President accepted the suggestion, and a small appropriation was made for printing some papers, then in Professor Whitfield's hand. At first it was deemed wise that all papers should be submitted to one or two scientific men outside of the Museum who should determine the eligibility of the paper for reproduction. This plan was followed for a short time, but was abandoned as inconvenient and unnecessary. The Curators were made the judges of the character of their own papers, and, as they expected criticism upon the broad impartial stage of the general and special scientific world, they were led to exercise great caution in their judgment. Finally a 'Committee on Publication' was formed by the President, of which officially all curators were members. Their deliberations determine to-day the nature, contents, extent of, and all details connected with the Museum publications. Appropriations of money for this work come under the control of the President of the Executive Committee. With the creation of new departments, new curators, and the extraordinary accession of material from expeditions, the number of papers pressing for publication increased, and a subsidiary outlet for this overflow was provided in scientific journals, a relief now used by the department of Archæology particularly. A restriction upon this scientific matter had early been instituted by limiting it to museum material, so that, except incidentally, all abstract discussions and scientific polemics, were excluded.

Besides the scientific publications there had been always printed by the Museum, the Annual Report, and occasional Guides to various departments, as the Guide to Invertebrate Paleontology, Guides to Birds and Mammals, and List of Birds found within 50 miles of New York City.

The Guides disappeared as failing in some ways to meet popular needs, but the Annual Reports have increased in size steadily, and are now illustrated reports on the condition of the various departments of the Museum in general, its aims, resources, and needs, being partially composed from the quarterly and annual reqorts repuired from the Curators, giving the condition, prospects, and requirements of their various interests.

It was an interesting coincidence that the appearance of the Bulletin was almost synchronous with the beginnings of the Department of Public Instruction. These two features certainly quite effectively give the Museum an educational character, and, in the two fields of popular instruction and scientific work, place its guarantee of good faith in its first pretensions, in the hands of the public.

In giving any epitomization of the contents of the Bulletins the most direct and succinct treatment will be a separation of their contents under the general classes of subjects represented in the various departments of the Museum, as Paleontology (vertebrate and invertebrate), Ornithology

and Mammalogy, Mineralogy and Geology, Conchology, Entomology, Invertebrate Zoology, Ethnology, Archæology, and then a very brief analysis of their contents, under the head of systematic work, investigation, and description of new species. The present number of volumes of the Bulletin is twelve.

The accompanying table shows the distribution of papers in the general departments of science enumerated in the first column. The Memoirs so far published embrace two volumes, as yet incomplete; Vol. I., parts 1, 2, contain papers on Invertebrate Paleontology, parts 3, 4 and 5 on Vertebrate Paleontology; Vol. II., parts 1, 2, contain papers on Ethnology, part 3 on Archæology.

Bulletin-Series; Analysis of Contents.

(Papers Published.)

	1	2	3	4	5	6	7	8	9	10	11	12
Ethnology									1	2		2
Archæology								3	1			
Mammalogy	2	5	15	3	12	9	5	5	9	5		7
Ornithology	2	10	5	6	2	1	1	4	2	1		3
Ichthyology and Herpetology	2								1	2		
Entomology				6	3	4	1	2	3	2		2
Invertebrate Zoology										2		1
Conchology	1											
Paleontology (vertebrates)		1	1	3	5	3	4	3	3	6		3
Paleontology (invertebrates)	10	4	3			1		2	4			
Geology	1		1					1				2
Mineralogy							1	1				1
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Pages	348	307	441	371	341	368	318	304	375	464		326
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A glance at this table shows the very evenly maintained interest and activity in Mammalogy and Ornithology, a less but noticeable industry in vertebrate and invertebrate Paleontology and Entomology, and the very imperfectly established attention to Geology, Mineralogy, Vertebrate and invetebrate Zoology, the absence of original work in Conchology, and the late contributions in Ethnology and Archæology.

When this series of scientific papers is examined by a less superficial and statistical method, the comparative importance of the papers becomes more obvious, and the deceptive results apparent of seeking equalization by enumeration simply. A paper of the far-reaching and suggestive character of Dr. Wortman's treatise on the Ganodonta for instance while counting only as one paper, in labor and intrinsic excellence might justly over-balance a number of less studious or incisive contributions. So perhaps might be instanced Dr. Matthews' paper on the 'Revision of the Puerco Fauna,' Dr. Boas' 'Decorative Art of the Indians of the North Pacific Coast,' Dr. Allen's 'Alleged Changes of Color in the Feathers of Birds without Moulting,' Professor Whitfield's 'Fossils of Lake Champlain,' and Professor Osborn's papers on fossil mammalia. The character of the articles throughout is thoroughly in keeping with the scientific aims of the institution, but they also of necessity vary in their relative value.

In the three lines of systematic work, description of new species, and investigation, the two first largely preoccupy the attention of the writers, as might be expected. The first issues of the Bulletin were

made at a time when the obvious material at hand was the specimens of the cabinets, and while they afforded theses on taxonomy, nomenclature, revision or description of species, it was not until the new phase of activity introduced by expeditions, allowed a broader range, and actually made investigation imperative, that this last became fully recognized. Amongst the first contributions in this direction was the publication of the interesting results of Professors Seely and Brainard's examination of the eastern shores of Lake Champlain.

These geologists discovered that the Calciferous and Chazy formations have here an unexpected development, and that there aggregate thickness ranges to near 2,500 feet, while a great group of fossil species forms a new and interesting fauna. The descriptions of the fossils from this region which deceived Professor Whitfield by their close resemblance to the Birdseye Limestone, formed perhaps the most important paper in the first volume of the Bulletin. In this paper Professor Whitfield described 33 new species and instituted two new genera of invertebrates, while there was shown to be a lower extension of the Trenton limestone than had been anticipated, mingling its characters with forms having a cambro-silurian expression.

Professors Brainard and Seely followed later in the Bulletin of the Geological Society with a careful analysis of the geological relations of these beds and confessed their own astonishment at the new views they felt compelled to present.

Professor Whitfield also in this first volume of the Museum Bulletin enlarged his important suggestion, previously made in the *American Journal of Science*, that the group of fossils which had been regarded as vegetable in their origin, viz, *Dictyophyton*, *Uphantænia*, *Cyathophycus* etc., were truly spongoid bodies and allied to the *Euplectella* or glass sponge of modern seas, a view coincided in by Dr. J. W. Dawson.

Professor Whitfield also in this volume of the Bulletin described a 'Fossil Scorpion from the Silurian rocks of America,' the earliest land animal described from American rocks, and of great interest as synchronous with similar discoveries in Sweden and Scotland. It naturally formed a new genus and was also made the type of a new family. Besides these papers a number of others prepared by Professor Whitfield were purely descriptive. In fact the character and value of the first volume of the Bulletin were determined by its geological and paleontological papers, as the other departments in the museum had then scarcely assumed a scientific direction, and their contributions were few and tentative. Amongst these however, Dr. J. A. Allen's paper on 'The Masked Bob-white of Arizona and its Allies' easily ranked first.

In the second volume of the Bulletin a rapid increase of the papers on contemporaneous Natural History is observed, outranking all other contributions. The rare West Indian Seal (*Monachus tropicalis* Gray) was described by Dr. Allen. This remarkable animal had previously only been known to naturalists by an 'imperfect skin, without skull' in the British Museum, and another specimen taken in 1883. In December, 1886, "Mr. Henry L. Ward, of Rochester, son of Professor Henry A. Ward, visited the three little keys off the northwest coast of Yucatan known as The Triangles, for the express purpose of securing specimens of this rare animal."

The Seals were found in considerable numbers but the circumstances were somewhat unfavorable. Forty-nine seals were killed, forty-two of which were taken away, but one of them was lost. From these materials Dr. Allen formed his paper. Papers on Collections of Birds from Ecuador, Bolivia, the Maximilian Types of S. A. Birds,

new species, and seasonal variation in *Elainea* by Dr. Allen and Mr. Chapman with further papers on mammals, furnished the bulk of contributions to this second volume of the Bulletin.

Professor Whitfield published further observations on the Calciferous Sandrock from Lake Champlain, and a description of a fossil barnacle from the Marcellus Shale which challenged attention from the hitherto unrecorded early age for a cirripede in American paleozoics.

The results of expeditions now rapidly appear in the succeeding bulletins, and collections made in Texas, British Columbia, West Indies, Mexico, Costa Rica, furnished many papers on birds and mammals for the third bulletin. Dr. E. A. Mearns contributed four papers on small American mammals, and a few further observations by Professor Whitfield completed this volume. Perhaps the most notable paper in this series was that of Dr. Allen on a 'Review of some of the North American Ground Squirrels of the Genus *Tamias*.'

In volume four of the Bulletin, completed in 1892, Entomology first makes its appearance amongst these papers, a series increased and continued by Mr. Beutenmüller in all succeeding publications of the Museum. These papers were confined to lists, for the most part, of collections in the Museum, and were occasioned largely by the new additions of specimens, secured in the Edwards and Elliott cabinets of insects. One paper of great usefulness was that devoted to Gall-producing Insects within 50 miles of New York City. Vertebrate Paleontology now assumed importance in the Museum, and the wonderful results of the expeditions to the west led to the important papers, in this subject, by Osborn, Wortman, and Matthews, a series developing in later issues to extraordinary interest and permanent importance. In this volume the analysis of *Protoceras* by Professor Osborn and Dr. Wortman was of especial value; Earle's Revision of Coryphodon was a helpful systematic study.

Dr. Allen and Mr. Chapman continued their systematic and descriptive work in ornithology and mammalogy, in which the former's 'Geographical Distribution of North American Mammals' furnished a splendid contribution to zoo-geography and involved a large review of observations, with an authoritative demarcation of the districts and faunas in the mammalian occupation of North America.

Volume fifth of the Bulletin contains systematic and descriptive articles and is conspicuously attractive, though perhaps falling somewhat below its predecessors in interest. Wortman's and Earle's paper on the 'Ancestors of the Tapir' strikes a strong note of original study, and Osborn and Wortman's establishment of a new genus *Artionyx* opened up some new lines of vertebrate relationship. Beutenmüller's 'Descriptive Catalogue of Butterflies found within fifty miles of New York City,' was distinctly useful.

Volume sixth continued the interest which was awakened in volume five. The papers were valuable and involved very diverse topics. The scientific treatment in a few was typical, as in Dr. Wortman's paper on the 'Osteology of *Patriofelis*.'

The articles of this sixth volume formed a very interesting series. A noticeable feature of the Bulletin was supplied by the Department of Vertebrate Paleontology and three papers of importance issued from the pens of Professor Osborn and Dr. Wortman. Amongst these the discussion of the osteology and critical position of *Patriofelis* challenged attention. It revealed an animal living in the later Eocene of aquatic or semi-aquatic habits, provided with powerful jaws, robust teeth, and probably depending on turtles for its subsistence. The Bridger basin swarmed with turtles, and

coprolites, possibly referable to this animal, have been found along its margin, in which turtle remains occur. Dr. Wortman indulges here in an interesting speculation; "when the lake disappeared, it can be conjectured that *Patriofelis* took to the open sea, and finally came to feed upon fish exclusively. It is further conceivable that in their new habitat their swimming power was gradually increased, and, owing to the soft nature of their food, the great strength and power of the jaws were gradually lost, and the teeth became gradually modified into the simple degenerate organs which constitute the dental equipment of the modern seals."

In this volume Mr. Chapman presented a long paper on the Birds of the Island of Trinidad; Dr. Allen furnished seven articles on mammalogy; Mr. Beutenmüller a very useful descriptive catalogue of the Orthoptera, found within fifty miles of New York City, and Professor Whitfield an instructive display of the resemblance to, and probable identity with, modern marine algæ, of Trenton age fossils, previously referred by Hall to graptolites.

Volume seven, in its contributions to science, was most distinguished by the papers it contained on Vertebrate Paleontology. These were the Fossil Mammals of the Puerco Beds, of the Uinta Basin, Perrissodactyls of the Lower Miocene White River Beds, and the Osteology of Agriochærus. Dr. Allen provided a careful analysis of Robert Kerr's English translation of 'The Systema Naturæ of Linnæus, as lately published, by the learned Professor Gmelin of the University of Göttingen' issued in 1792, which analysis afforded a useful nomenclatural essay, and belonged to that species of scientific work which may be designated as 'housecleaning.' Kerr's specific and generic names were standardized, and their relevancy or irrelevancy considered. Mr. Beutenmüller gave another of his useful catalogues of insects found within fifty miles of New York City, this being in this instance the *Sphingidæ* or Hawk-Moths. Dr. Hovey contributed notes on New York Island minerals, and Mr. Chapman ornithological notes on Trinidad Birds. Volume eight of the Bulletin (1896) opened with three articles on changes in the plumage of birds, two studies of the Dunlin, Sanderling and Snowflake by Mr. Chapman, and a short general discussion of 'alleged changes of color in the feathers of birds without moulting' by Dr. Allen. These were possibly occasioned by Gätke's notable proposition that the plumage of birds changed without moulting. Dr. Allen and Mr. Chapman's conclusions constituted a refutation of Gätke's heterodox thesis.

The papers on vertebrate Paleontology were continued, and amongst them Professor Osborn's 'Cranial Evolution of Titanotherium' possesses extreme interest. This paper forms a model of conciseness and definite aim. It reveals the accentuation and disappearance of morphological characters, and is a contribution to the demonstration of the plasticity of animal forms. Dr. Wortman, somewhat contrasting in treatment, discusses the species of *Hyracotherium* (fossil horse) and straightens out some of the tangled synonomy of these perissodactyls. A paper of critical interest was Beutenmüller's review of the *Sesiidæ*, or clear winged moths, found in America, north of Mexico, and which was a contribution preliminary to his Memoirs, yet unpublished, on this family.

Archæology appears for the first time in three papers by A. E. Douglass, M. H. Saville, and James Teit, the first being an attempt at a table of geographical distribution of American Indian Relics.

Papers on Mammalogy, Ornithology, Entomology, and invertebrate Paleontology are continued, and the enumeration and notes on Birds in Yucatan, by Mr.

Chapman, seems particularly interesting. The volume closes with a second contribution on the Geology of Lake Champlain, by Professors Brainard and Seely, in which the Chazy beds of that instructive region are especially discussed.

Bulletin nine contains twenty-four articles and was a very exhaustive display of the scientific activity of the corps of research in the Museum. Some papers were of exceptional merit as Dr. Wortman's admirable review of the Ganodonta, a suborder of the Sloths, Dr. Matthew's revision of the Puerco Fauna, and Dr. Boas' Decorative Art of the Indians of the North Pacific Coast.

In the first Dr. Wortman established the strong probability that the sloths of South America were derived from the Ganodonta of North America; in the second Dr. Matthew revised the Puerco Fauna, and accentuated the 'entire distinctness of the species of the upper and lower beds,' and in the third Dr. Boas painstakingly analyzes the scheme, motive, and meaning of the conventionalized and derivative decorative art of the Indians of the North Pacific coast of America.

The systematic and descriptive papers of J. A. Allen, Frank M. Chapman, William Beutenmüller, were continued. Professor Osborn contributed an authoritative paper on 'The Huerfano Lake Basin, Southern Colorado, and its Wind River and Bridger Fauna.' Professor Whitfield publishes in this volume of the Bulletin a paper of considerable interest, being a description of species of Rudistæ, a remarkable group of Lamellibranchs or bivalves which are only known from the Cretaceous, these here described by Professor Whitfield coming from Jamaica. Professor Whitfield contributed a second paper on the peculiar genus *Barrettia* which Woodward, who instituted the genus, considered, though with hesitation, as a bivalve shell. Professor Whitfield reverts to Woodward's alternate suggestion that they might be corals, and delicately emphasizes the considerations favoring this view.

A paper of zoological importance was devoted to a preliminary description of a new mountain sheep (*Ovis Stonei*), by Dr. Allen. This attractive ruminant was obtained on the headwaters of the Stickeen River, British N. W. Territory, near the Alaskan boundary, at an altitude of 6500 feet. Color, size and character of horns seem to distinguish it as new.

This volume of the Bulletin contains a description of an extraordinary Terra Cotta figure from the Valley of Mexico which presents a life-size figure of a singing man, with arms extended and mouth opened, dressed apparently in armor. This really effective and striking relic was described by Mr. Marshall H. Saville.

Other papers by Juan Vilaro and Tarleton H. Bean conclude the volume.

The tenth volume of the Bulletin contains a very valuable revision of the Red Squirrels or Chickarees by Dr. Allen, which, in a subject of great difficulty, must rank high amongst these reconstructions of this phylum. Dr. Wortman produced for this volume a masterly study of the 'Extinct *Comelidæ* of the U. S.' It perhaps may rank higher than any of this writer's contributions to these bulletins. The conclusions are fragmentary, but the light secured was concentrated upon a difficult and intricate theme. Professor Osborn contributed five papers on vertebrate paleontology of varying interest, but all of scientific importance. To a less technical scrutiny the notes on the great Dinosaur (*Camarasaurus*) seem the most interesting. Mr. Beutenmüller continued his most useful diagnoses of insects (Lepidoptera) with especial reference to those near New York.

Dr. Lumholtz furnished notes on the Huichol Indians of Mexico, and, in con-

junction with Dr. Alës Hrdlicka, a paper upon marked human bones from a Prehistoric Tarasco Indian Burial Place in Michoacan, Mexico. The former, according to the writer were almost an unknown Indian tribe of about four thousand, living in a mountainous country, difficult of access, in the northwestern part of the State of Jalisco, on a spur of the great Sierra Madre. Their great interest arises from their religious proclivities, and while nominally Christians, their peculiar symbolism and intricate ritualistic usages, retain a trace of their pagan character, and in them, it is suspected, there remain relics of the ancient Cuachichilian culture. In this bulletin a paper by Dr. Lumholtz and Hrdlicka on marked human bones revealed an odd practice of marking or notching the bones of the dead. These bones are regarded as trophies "from fallen enemies, and the grooves signified the number slain by the owner of the bone."

Dr. Allen, Mr. Chapman, Dr. Bean, supplied papers on mammals, birds, fishes, and Dr. E. A. Mearns a general study of the fauna of the Hudson Highlands.

Volume eleven of the Bulletin is entirely devoted to a Catalogue of the Type specimens contained in the Hall collection of fossils. The Hall collection contains a great number of the original specimens described in the Paleontology of New York, and a complete list of these is of importance. This Catalogue was prepared by Professor R. P. Whitfield assisted by Dr. E. O. Hovey.

Volume twelve contained twenty-one papers quite evenly distributed amongst the subjects hitherto treated in the Bulletin. Some important additions were made to North American mammals by Dr. Allen from the results of the Constable Expedition to Arctic North America conducted by A. J. Stone. Amongst these were further notes on the new Mountain Sheep (*Ovis Stonei*), a new Jumping Mouse, four new Voles. Dr. Allen also described in this Bulletin new rodents from the United States and South America; Mr. Chapman reviewed the birds taken on the Peary Expedition to Greenland; Mr. E. W. Nelson gave descriptions of new squirrels from South America; Mr. Gerritt S. Miller of new bats from the West Indies.

A very interesting paper by Dr. Alës Hrdlicka on an 'Ancient Anomalous Skeleton from the Valley of Mexico' revealed human remains having 26 ribs instead of the usual number 24. Furthermore this additional pair of ribs appears to be cervical, as there was found 'an articular facet on each side of the seventh cervical,' which, if granted, proved an extension of the thorax upward. There was also a partial blending of the first and second ribs, or there was a 'bicipital rib.' The interest of these facts appears to lie in the indicated reversion to lower animal forms. The tibiæ are flattened (platycnemic), with a backward inclination of their heads. Whether these remains were Aztecan or Taltecan, the author of this paper was unable, from known data to say.

Mr. Beutenmüller continued his able synopses and revisions of Lepidoptera.

The papers which conferred the most distinction on this volume were those relating to vetebrate paleontology. These were four in number from the pens of Professor Osborn, Dr. Wortman and Dr. Matthew. The ancestry of the dogs, foxes, otters, was discussed, by which it was shown that their descent could be traced from the Eocene, that the family of the Procyonidæ (a small family holding the American raccoons) could be traced as an offshoot of the dogs in the later Eocene (Oligocene), that the South American Foxes came from North American Miocene species, and that the establishment of the new family Viverravidæ was necessary. This

family was considered as "the forerunner of the Viverrine phylum whose members towards the close of the Eocene migrated to Asia."

The second paper by Dr. Wortman on *Oxyæna lupina* Cope, contained a full description of this species, typical of one family of the *Creodonta* (flesh-eaters). Dr. Matthews's paper was a careful tabulation of the fauna of the fresh water tertiary of the west. Professor Osborn contributed his third paper on Dinosaurs making a comparison of the fore and hind limbs of these extraordinary creatures, the dimensions of whose legs, in some cases, (*Brontosaurus*) reached the extreme limit of ten feet.

This twelfth volume of the Bulletin closed with a description of the Eskimo of Smith Sound by A. L. Kroeber. These were Ross' Arctic Highlanders, and the subject of Mr. Kroeber's paper was the six natives secured by Lieut. Peary and brought to this city in 1897. The implements of these singular aborigines were described, and their sociology, religion and cosmology.

These Smith Sound Eskimo are regarded as, ethnologically, similar to the Greenland Eskimo, and claims for their distinctness and insulation are repudiated.

Their religion is vague, but practically centers around the 'medicine man,' or shaman, their morals dubious, and their government formless.

Amongst shorter papers in the tenth volume was a notice of a superb specimen of *Madrepora palmata* which Professor Whitfield obtained in the Bahamas and which now forms a conspicuous ornament of the Coral collection in the Museum halls.

These Bulletins of the Museum have now an established reputation, and form a feature as important in its scientific life, as does the beautiful or appropriate exhibition of its collections in its educational work.

L. P. Gratacap.

THE VERTEBRAL FORMULA IN DIPLODOCUS, MARSH.

In the Memoirs of the American Museum of Natural History, Volume I., Part V., Professor Henry F. Osborn has given a careful and exceedingly interesting account of the skeleton of a *Diplodocus* discovered in 1897 near the Como Bluffs in Wyoming by an exploring party sent out by the American Museum.

In the summer of 1899 the expedition sent out to the fossil fields of Wyoming by the Carnegie Museum at the instance and expense of the generous founder of the institution, succeeded in discovering a second skeleton of *Diplodocus*, which furnishes information as to many portions which were lacking in the specimen belonging to the American Museum. The two specimens are in many respects complementary to each other. The specimen described by Professor Osborn consisted of the left neural arches of three cervicals; eight posterior dorsals lacking the centra; the sacrum lacking the first and second centra and consisting of four vertebræ; caudal vertebræ Nos. 1–21, and 23–27, complete with chevrons; portions of caudals 32, 33, and 35 (estimated); the ribs of the three posterior dorsals; the left ilium and ischium; the upper three-fourths of the left femur, and the right scapula. The specimen belonging to the Carnegie Museum consists of eleven cervicals, ten dorsals, four sacrals lacking the left sides of the centra, the twelve anterior caudals, with chevrons; eighteen ribs, two of them imperfect; the right ilium, and the peduncle of the left ilium; the two ischia and the two pubic bones; the right femur entire; the left scapula and coracoid coössified, and the two sternal plates. The work of excavation has not yet been completed, having been interrupted in the latter part of September, 1899, by the advent of severe weather. It has been resumed at this date and it is hoped that further uncovering of

the hillside, on which the discovery was made, will result in the discovery of some additional portions of the skeleton.

It is not the intention of the writer in these lines to enter into a description or discussion of these exceedingly interesting and important remains, save for the purpose of calling attention to the fact that the specimen under consideration appears to throw light upon the hitherto unsettled number of the dorsal vertebræ in the Sauropoda. Professor Marsh has figured the number of dorsals in *Brontosaurus* as fourteen. Professor Osborn in his memoir says "We may provisionally adopt 15 as the number in *Diplodocus*." The specimen obtained by the Carnegie Museum shows but ten dorsal vertebræ. These vertebræ were found in regular order from the sacrum forward. The six posterior presacral vertebræ interlocked by their zygapophyses. The seventh and eighth presacrals articulated with each other, but were displaced vertically, having been depressed in the mud, which subsequently solidified to form the matrix. The ninth and tenth were also interlocked, and no gap existed between the eighth and ninth except that produced by the depression already noted. The first cervical lying in front of the tenth presacral was displaced at an angle from the axial line of the skeleton, but if restored to a normal position the gap between it and the most anterior of the dorsals would have been filled, and, now that these vertebræ have been freed from the matrix, they are found to closely articulate. The cervicals were for the most part interarticulated, all lying in such position as to show the serial order.*

*I am indebted to Mr. A. S. Coggeshall, the Chief Preparator in the Department of Vertebrate Paleontology in the Carnegie Museum, for the statements given above as to the exact location *in situ* of the vertebræ. Mr. Coggeshall preserved accurate memoranda of locations in the field-notes, which he made while assisting in the exhumation of the remains.

From the foregoing facts it appears that the number of dorsal vertebræ in *Diplodocus* is only ten.

A further confirmation of this view is derived from the number of ribs which were discovered. Beginning with the dorsal vertebræ immediately before the sacrum we find the short posterior ribs as delineated by Professor Osborn, followed, as we advance, by ribs rapidly increasing in length, until we find attached to the seventh presacral a rib five feet eight and a half inches in length. This represents the maximum development in the length of the ribs. Both ribs of the seventh presacral have been recovered. We have not found time as yet to carefully adjust the ribs to the vertebræ, but we have every reason to think that we have recovered all of them except two. Twenty is then the number of the dorsal ribs in *Diplodocus* and the inference is plain that there must have been but ten dorsal vertebræ.

The correspondence between the structures of the sacral region in *Diplodocus* and those found in the struthionid birds has already been pointed out by Professor Osborn. I may say that this likeness is further shown in the number of the dorsal vertebræ, and the conformation of the scapular girdle, as well as in certain features of the cervical vertebræ. These colossal reptilia reveal in portions of their osseous framework marked tendencies in the direction of a development along avian lines.

Cervicals	at least 13	Eleven are found in the specimen at the Carnegie Museum, atlas and axis being as yet undiscovered. There may have been more than thirteen cervicals, though their great length, averaging two feet, seems to militate against the existence of many more than the number given.
Dorsals	10	
Sacrals	4	Both specimens agree in showing only four sacrals.
Caudals	32–35 (Osborn).	

Collating the facts ascertained from the two skeletons of *Diplodocus*, the one in the American Museum, and the other in the Carnegie Museum, we ascertain that the vertebral formula of *Diplodocus* was as given on page 817.

A paper giving a full account of the specimen belonging to the Carnegie Museum will appear in the Memoirs of this Institution.

W. J. Holland.

Carnegie Museum,
May 10, 1900.

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*UNVEILING OF THE HUXLEY MEMORIAL.**

A large assembly, representative of many interests and many nationalities, the Prince of Wales at their head, met in the great hall of the Natural History Museum, South Kensington, on Saturday, to do honor to one who, in a degree rarely paralleled, was at once a great man of science and a great man of literature. The occasion was the acceptance by the Prince of Wales, on behalf of the trustees of the British Museum, of a statute of Mr. Huxley, presented in the name of the subscribers by the veteran Sir Joseph Hooker, and may be regarded in some sense as an *eirenicon*, for among the official persons present was the Bishop of Winchester, the successor of a doughty opponent of the late Professor; and the statue faces the stately and simple figure of a former scientific antagonist—Owen. The Prince of Wales was president, Lord Avebury, honorary treasurer, and Professor G. B. Howes, honorary secretary of the memorial committee. Huxley had a rare power of winning the regard and affection of his pupils, and many of them, unknown to fame, came to do him reverence.

Professor Ray Lankester, Director of the Museum, made the following statement: The duty of briefly explaining the nature of the present proceedings has devolved upon me. I feel it to be a great privilege to discharge this duty on the occasion designed to do honor to my venerated master, Professor Huxley. This celebration would have been no less dear to Huxley's fellow-worker and friend, the late Director of this Museum, Sir William Flower, who, unhappily, is no longer with us to witness the completion of the memorial statue which he especially desired to see placed in this hall. A few months after Professor Huxley's death in 1895 a committee was formed for the purpose of establishing a memorial of the great naturalist and teacher. At a meeting of that committee, held on November 27, 1895, at which 250 members were present and at which his Grace the Duke of Devonshire presided, the following resolution was carried: "That the memorial do take the form of a statue, to be placed in the Museum of Natural History, and a medal in connection with the Royal College of Science, and that the surplus be devoted to the furtherance of biological science in some manner to be hereafter determined by the committee, dependent upon the amount collected." From all parts of the world, besides our own country, from every State of Europe, from India and the remotest colonies, and from the United States of America subscriptions have been received for the Huxley Memorial, amounting in all to £3380. (Cheers.) Three years ago the committee commissioned and obtained the execution of a medal bearing the portrait of Huxley, and has established its presentation as a distinguished reward in the Royal College of Science. The republication of the complete series of Huxley's scientific memoirs, which was proposed as one of the memorials to be carried out by the committee, has been undertaken by Messrs. Macmillan without assistance from the committee. I am glad to be able to state that two large volumes of these richly-illustrated contributions to science have

* From the London *Times*.

been already published. Whilst these other memorials were in progress under the auspices of the executive committee they secured the services of Mr. Onslow Ford, R.A., to execute the statue which it had been decided by the general committee to regard as the chief object of the subscriptions entrusted to them. On the completion of the statue the Trustees of the British Museum agreed to receive it and to place it in the great hall where we are now assembled. On behalf the vast body of subscribers to the memorial Sir Joseph Hooker, Huxley's oldest and closest friend, himself the survivor of that distinguished group of naturalists, including Charles Lyell, Richard Owen and Charles Darwin, who shed so much lustre on English science in the Victorian age, will hand over the statue of Huxley to the Trustees of the British Museum. Your Royal Highness has been graciously pleased, as one of the Trustees, to represent them on the present occasion, and to receive the statue on their behalf. The memorial statue of Huxley is the expression of the admiration, not only of the English people, but of the whole civilized world, for one who as discoverer, teacher, writer and man must be reckoned among the greatest figures in the records of our age.

Sir Joseph Hooker said: I have the honor of being deputed, by the subscribers to the statue of my friend the late Professor Huxley, to transfer it to your Royal Highness, on behalf of the trustees of the British Museum, with the intent that it should be retained in this noble hall as a companion to the statues of Professor Huxley's distinguished predecessors, Sir Joseph Banks, Mr. Darwin and Sir Richard Owen. It would be a work of supererogation on my part, even were I competent to do so, to dwell upon Professor Huxley's claims to so great an honor, whether as a profound scientific investigator of the first rank, or as a teacher, or as a public servant; but I may be allowed to indicate a parallelism between his career and that of two of the eminent naturalists to whom I have alluded, which appears to me to afford an argument in favor of retaining his statue in proximity to theirs. Sir Joseph Banks, Mr. Darwin, and Professor Huxley all entered upon their effective scientific careers by embarking on voyages of circumnavigation for the purpose of discovery and research under the flag of the Royal Navy. Sir Joseph Banks and Professor Huxley were both presidents of the Royal Society, were trustees of the British Museum; and, what is more notable by far, so highly were their scientific services estimated by the Crown and their country, that they both attained to the rare honor of being called to seats in the Privy Councils of their respective Sovereigns. With these few words I would ask your Royal Highness graciously to accede to the prayer of the subscribers to this statue, and receive it on behalf of the trustees of the British Museum.

Professor Sir Michael Foster, following, said: Before your Royal Highness unveils this statue it is my duty and privilege to add a few words to those which have just been spoken by the beloved Nestor of biological science. Sir Joseph D. Hooker, born before Huxley was born, a sworn comrade of his in the battle of science, standing by him and helping him like a brother all through his strenuous life, may, perhaps, be allowed to shrink from saying what he thinks of the great work which Huxley did. We of the younger generations, Huxley's children in science, who know full well that anything we may have been able to do springs from what he did for us, cannot on this great occasion be wholly silent. Some of us have at times thought that Huxley gave up for mankind much which was meant for the narrower sphere of science; but if science may seem to have been thereby

the loser, mankind was certainly the gainer; and, indeed, it was a gain to science itself to be taught that her interests were not hers alone, and that not by one tie or by two, but by many, was her welfare bound up with the common good of all. To many, perhaps, the great man whose memory we are here met to honor was known chiefly as the brilliant expositor of the far-reaching views of that other great man who through his statue is now looking down upon us. Your Royal Highness is doubtless at this moment thinking of that interesting occasion, fifteen years ago, when you unveiled that statue of Darwin, and you are calling to mind the weighty words then spoken by him whose own statue brings us here to-day. Huxley, it is true, fought for Darwin, and, indeed, 'he was ever a fighter.' But he fought not that Darwin might prevail; he fought for this alone—that the views which Darwin had brought forward might be examined solely by the clear light of truth, untroubled by the passion of party or by the prejudice of preconceived opinion. As he never claimed for those views the infallibility of a new gospel, so he always demanded that they should not be peremptorily set aside as already proved to be wrong. Huxley worked for his fellow-men in many ways other than the way of quiet scientific research. Had we not known this we should have thought that his whole life had been given up to original scientific investigation, so much has the progress of biological science, since he put his hand to it, been due to his labors. On the sands of many a track of biologic inquiry he has left his footprints, and his footprint has ever been to those coming after him a token to press on with courage and with hope. The truths with which he enriched science are made known in his written works; but that is a part only of what he did for science. No younger man, coming to him for help and guidance, ever went empty away; and we all—anatomists, zoologists, geologists, physiologists, botanists, and anthropologists—came to him. The biologists of to-day, all of us, not of this country alone, but of the whole world of science, forming, as it were, a scattered fleeting monument of this great man, are proud at the unveiling of this visible lasting statue here. May I crave your Royal Highness's permission to seize this opportunity to assure you incidentally, but none the less from the bottom of our hearts, on the part of men of science, that we in common with all her Majesty's subjects are rejoicing that you escaped the dreadful peril to which a few days back you were exposed, and to express to you our continued esteem and respect.

The Duke of Devonshire said: I had the honor nearly five years ago of presiding over a meeting of the committee which had been formed for the purpose of establishing a memorial to Professor Huxley. I have now to report to your Royal Highness that the labors of that committee are completed, and that they desire to present the statue to your Royal Highness on behalf of the Trustees of the British Museum. The subscriptions to this memorial, as Professor Ray Lankester has already observed, have come not only from this country, but from every other civilized country in the world. This beautiful statue, the work of Mr. Onslow Ford, has been completed under the superintendence of the committee, but the real memorial of the man is to be found in his writings and in the influence which he exercised and is still exercising upon the minds of younger men, many of whom, we may hope, will in the future emulate his noble example.

The Prince of Wales then, amid cheers, withdrew the covering from the statue, and said: I consider it a very high compliment that I have been asked to-day by the Huxley Memorial Committee to unveil this

statue, and to do so in the name of the Trustees of the British Museum, of whom I have the honor to be one. I have not forgotten that 15 years ago I performed a similar duty in connection with the fine statue of the celebrated Charles Darwin, which is at the top of the stairs, that was similarly handed over to the British Museum. We have heard to-day most eloquent and interesting speeches with reference to the illustrious man of science and the great thinker, Professor Huxley. It would therefore be both superfluous and I may even say unbecoming of me to sound his praises in the presence of so many men of science, who know far more about all his work than I do. I can only on my own part endorse everything that has fallen from the lips of those gentlemen who have spoken, and I beg only to repeat what great pleasure it has given me for the second time to have performed the interesting ceremony of taking over the statue of another great and illustrious man of science.

The statue is of marble and represents Huxley seated with his head somewhat bent, his right hand grasping the end of the chair, and his left clenched, as though, perhaps, to enforce an argument. He wears a gown and hood to indicate the honors of which, in more than one university, he was the recipient. The bushy eyebrows and the characteristic combativeness of his strong face are well realized, though in matter of likeness some who knew him well were not altogether satisfied. The work is of great beauty and finish, especially in the decoration of the chair. But it is permissible to doubt the suitability to a great personality not trained in a university or the inheritor of traditional methods, of the sitting posture and the academic attire. A great champion of the causes he espoused and formidable opponent of what he regarded as outworn theories, a standing attitude and such simple drapery as Owen wears before him might have better represented the man as he was in the flesh. But the work unquestionably possesses great artistic merit. The statue bears the inscription—

THOMAS HENRY HUXLEY,
Born May 4, 1825.
Died June 29, 1895.

SCIENTIFIC BOOKS.

A Manual of Zoology. By T. JEFFREY PARKER and WILLIAM A. HASWELL. Revised and adapted for the use of American schools and colleges. New York, The Macmillan Co. 1900. Pp. xxv+563; 327 figs. Price, $1.60.

This useful manual has been abridged from the well-known larger *Text-book of Zoology* by the same authors, with the intention of meeting the needs of students in the higher classes of schools. The book retains many of the merits that won so favorable a reception for the larger work. It is concise, clearly written, well illustrated and abreast of the times. It may nevertheless be questioned whether the 'Manual' is as well adapted to its purpose as the 'Text-book.' However widely teachers of zoology in the schools differ in regard to the plan and scope of work, most of them will probably agree that a text-book satisfactory for their purpose is hardly to be made by simple abridgement of a larger technical work, as has been done in this instance. By following this method the authors have produced a work which, despite many admirable features, is too largely a mass of technical anatomical detail, some of which might well have been sacrificed to make room for fuller accounts of the general natural history and relationships of animals, of physiological principles and of broader biological questions.

We fear that the American teacher who reads in the preface that this edition has been 'adapted for the use of American schools' will hardly feel himself fairly treated when he searches in the text for the basis of this statement. Here and there reference is incidentally made to char-

acteristic American forms, and a few—a very few—such forms are figured. With few exceptions, however, both the types and the forms described for comparison are European species, some of which differ materially from their American cousins; and we think the American editor might have taken the trouble to select American representatives of such common types as the tortoise, frog, salamander, snail, grass-hopper, *Nereis* and sea-anemone, or to describe the anatomy of the common squid instead of the European cuttle-fish. The book is nevertheless a very excellent one and will doubtless be welcomed by American teachers.

E. B. W.

A First Book of Organic Evolution. By D. Kerfoot Shute, A.B., M.D. Chicago, The Open Court Publishing Company. 1899. Pp. xvi + 285.

This is a brief account of some of the facts and theories that cluster around the central idea of Organic Evolution. The principle of heredity forms the guiding idea in connection with which is given, among other things, a discussion of the cell-theory, of variation, of the influence of environment, natural selection and the evolution of man. The last section gives a synopsis of the classification of animals, and, *in a half page*, of plants. There is a list of works of reference that may be useful to the general reader, and a glossary of terms that is on the whole accurate. The majority of the illustrations are good, especially the series of full-page plates prepared especially for the work. In the chapter on man sociological and ethical questions are discussed, the idea of design is upheld, and the author decides for a cosmic soul that 'may be self-conscious, wills, thinks, acts and designs.' "Man is the highest and greatest fruitage of the tree of animal life." "He has been the goal and is the completion of organic evolution." "He is not only the highest creature that has ever appeared on the globe, but it seems a safe induction to say that he is also the highest animal that evolution will ever develop here."

If anyone doubts that man is 'the topmost flower on the highest and *straightest* branch of the tree of life,' he has only to consult the diagram on p. 182.

In reading 'this little book' one has continually to remind oneself that it is a 'first book,' that is a primer, and that all the author has tried to do is to sketch an *outline* of modern biology as related to the theory of descent. Considering the limits of space and the almost infinite number and variety of the data from which selection is to be made, it must be admitted that the author undertook a difficult task. When we say, that one altogether unfamiliar with scientific biology might digest the whole book without acquiring any very serious errors of opinion, we are giving high praise. But, if such an one were to come later to the practical study of medicine or advanced biology, he might be surprised to learn, that the diagram of the maturation and fertilization of the *human* ovum given on p. 30 is a pure figment of the imagination, seeing that no one has ever observed these phenomena in the egg of man, that the chromatin of the nucleus is ever in any other form than that of threads, and that therefore *chromatin* and *chromosomes* are *not* synonymous terms (glossary and *passim*), that the nutrition of a cell does *not* include irritability and contractility (p. 7), that a cell is not necessarily *encysted* because it possesses a cell-wall, that parthenogenesis is not a form of budding (p. 42), nor is the fertilized egg '*hermaphrodite*' (p. 43). These are but a few examples of the altogether uncritical use of illustrations and terms, which is only partly excusable on the ground of the popular nature of the book.

The book is also dogmatic. A certain amount of dogmatism is unavoidable, and perhaps even to be desired in so popular a work. But it would be difficult to justify the following statement: "Intemperate people * * * also transmit" (by inheritance to their offspring) "the fatal tendency to crave for *the very substances* that have acted as poisons on these germ-cells before and after fertilization." The transition from fact to theory is, indeed, everywhere so easily made, that one uninitiated must be in constant doubt of his footing.

While the book never rises above the intellectual or literary level of the freshman class

in college, it seems to me perhaps as good an epitome as we possess, within so narrow limits, of the facts and principles of organic evolution.

FRANK R. LILLIE.

Produits aromatiques artificiels et naturels. By GEORGES F. JAUBERT, Docteur és Sciences, ancien Préparateur de Chimie á l'École Polytechnique. (Encyclopédie scientifique des Aide-Mémoire.) Petit in-8. Pages 169.

This is the sequel to the author's previous book 'Matières odorantes artificielles' (reviewed in this JOURNAL, XI., 710), and resembles it closely in all respects. The former volume contained the nitro and halogen derivatives, phenols, and aldehydes; while, in the present one, the remaining odoriferous substances are grouped in the following chapters:

I. Aromatic alcohols (34 listed).
II. Aromatic acids and their derivatives (70 listed).
III. Terpenes (22 listed).
IV. Camphors (20 listed).
V. Terpene alcohols, aldehydes, and acids (10 listed). This includes such compounds as geraniol, citral and ionone, but no terpene *acids* are mentioned.

There are in all 169 pages—41 pages of text (including the Preface), 121 pages of tables, and 7 pages of index.

No one could guess from the title just what might be the scope of this book, and most chemists, even after a careful examination, will still be in doubt as to what the author is endeavoring to tabulate, for many of the compounds listed are 'aromatic' only to the extent of containing a benzene nucleus and have not the remotest interest in perfumery, although the author's idea of a perfume seems to be different from that of most chemists, since he says on page 48: "Les acides benzoique et cinnamique sont á l'état pur des parfums puissants."

The column in the tables headed 'Literature and Patents' is unsatisfactory, being either meagre and not up to date, or else merely a reference to some larger work and not to the original article at all; while, in spite of the heading, not a single patent reference is given in the entire book.

By endeavoring to expand to two volumes what could much better have been given in one, the author has been forced to introduce a large amount of wholly extraneous material, and has thus completely defeated the main object of memory aid, which is to present the important facts concisely and entirely free from all that is either irrelevant or of only remote interest.

MARSTON TAYLOR BOGERT.

COLUMBIA UNIVERSITY.

The Compendious Manual of Qualitative Chemical Analysis of C. W. ELIOT and F. H. STORER, as revised by W. R. NICHOLS. Nineteenth edition, newly revised by W. B. LINDSAY, Professor of general and analytical chemistry in Dickinson College, and F. H. STORER, Professor of agricultural chemistry in Harvard University. New York, D. van Nostrand Co. 1899. Pp. 202. Price, $1.25.

It is now over thirty years since the first edition of this book was published, and throughout this time it has held its place as one of the best simple manuals. The present edition is thoroughly modern and satisfactory. It is the avowed scheme of the editors to give but one method for each separation, and considering the elementary nature of the book their choice of methods must be commended. In its present form 'Eliot and Storer' will maintain its past reputation.

E. RENOUF.

Victor von Richter's Organic Chemistry or Chemistry of the Carbon Compounds. Edited by PROFESSOR R. ANSCHÜTZ, University of Bonn. Authorized translation by EDGAR F. SMITH, Professor of Chemistry, University of Pennsylvania. Third American from the eighth German edition. Vol. II. Carbocyclic and Heterocyclic Series. Philadelphia, P. Blakiston's Sons & Co. 1900. Pp. 671. Price, $3.00.

The first volume of this book was reviewed in SCIENCE, Vol. IX., p. 729. The praise given to the first volume should be extended to the second. One needs merely to open the volume at random and read, to recognize the merits of the book. The chapters on diazo compounds, on azines, on terpenes, on quinones are notable examples of thoroughness, and of the amount of recent research often condensed into a few lines.

It must be noted that this is not a book for

beginners. A student with some knowledge of organic chemistry could use it as a text-book if it were possible for him to resolutely confine his attention to the 'coarse print.' But it is as a reference book for the student who wishes to refresh his memory not merely of one compound, but of the complete chemistry of a group of compounds, that the work is of peculiar value, and may be cordially recommended.

EDWARD RENOUF.

Optical Activity and Chemical Composition. By DR. H. LANDOLT, Professor of Chemistry in the University of Berlin. Translated, with the author's permission, by JOHN MCCRAE, Ph.D. Whittaker and Co., London, and the Macmillan Co., 66 Fifth Ave., New York. 1899. Small 8vo. Pp. 158. Price, $1.00.

This little book forms a translation of the eighth chapter of the first volume of Graham-Otto's 'Lehrbuch der Chemie' and is a smaller and condensed edition of the author's well-known 'Das optische Drehungsvermögen organischer Substanzen und dessen praktische Anwendungen,' published in 1898. The subject is treated under three heads: I. General Principles of Optical Activity; II. Connection between the Rotatory Power and the Chemical Composition of Carbon Compounds, and III. Connection between Degree of Rotation and Chemical Constitution. Under the first head are discussed such subjects as crystal rotation, liquid rotation, molecular rotation, measurement of rotation, specific rotation, variations of specific rotation with concentration and change of rotatory power of dissolved substances with time, multirotation. Under the second head are treated optical modifications, the investigations of Pasteur, the van't Hoff and Le Bel theory, calculation of the number of optically active isomers of a compound from the number of asymmetric carbon atoms which it contains, the formation and properties of racemic compounds, resolution of racemic substances into the antipodes, formation and properties of the active modifications, transformation of one antipode into the other, the configurationally inactive non-decomposable modifications and their differences from racemic inactive isomers. Under the third head are taken up isomeric compounds, including stereoisomers, homologous series, influence of the mode of linkage of the carbon atoms, summation of the rotatory actions of several asymmetric groups, optical superposition and the dependence of the rotatory power of an active atomic grouping on the masses of the four radicles united to the asymmetric carbon atom, the hypothesis of Guye.

The translation is well done and the subject is brought up to date by notes and additions by the translator. The subject is presented in a very attractive and readable form and the book can be heartily recommended to anyone, who desires to know the present state of our knowledge regarding the relation existing between optical activity and chemical composition; though for more detailed information Landolt's 'Das optische Drehungsvermögen organischer Substanzen und dessen praktische Anwendungen' must be used.

W. R. ORNDORFF.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Osprey* for April, a little belated, opens with the fourth part of 'Birds of the Road,' by Paul Bartsch. Wm. L. Wells describes the 'Nesting of some Rare Birds,' including the yellow rail and solitary sandpiper, and Theodore Gill presents the second part of 'William Swainson and his Times' which carries Swainson through his journey to Brazil. In editorial comments under 'Birds and Women' the situation is summed up in a few words "If the demand exists for anything, that demand will be supplied if it can be done with a profit." Under Notes is to be found an extraordinary account of 'How Two Lions stopped an African Railroad,' and other matters of interest.

A Bulletin of Mathematics and of the Physical and Natural Sciences, to be published semi-monthly in the interest of teachers in Italian schools, has been established by Professor Alberto Conti, of Bologne.

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON.

THE 101st meeting of the Society was held at the Cosmos Club April 11, 1900.

The following papers were presented on the regular program:

Physiographic Development of the Black Hills: By MR. N. H. DARTON.

The principal period of uplift of the Black Hills dome was in the earlier tertiary time. During the progress of this uplift the larger features of the present topography were developed. The main north and south divide lies west of the apparent center of the uplift as the dome now stands, the cause for which is not yet ascertained.

The area of deposition of the White River deposits of the late Oligocene extended far up the flanks and into the valleys of the Black Hills apparently completely filling many of the old depressions. Following White River deposition the Black Hills were lifted both as a whole and also with increased doming and the new drainage was in part revived and in part superimposed. In the superimposition of drainage on the east side of the Hills there is evidence of a general tilting to the northeast so that portions of the revived pre-Oligocene valleys now appear to be robbed by their neighbors to the north, the present channels offsetting at intervals in that direction across former divides. A period of early Pleistocene base-leveling is recognized which had much to do with readjusting the drainage on the east side of the Hills. It cut deeply into the White River deposits planing them off over wide areas and depositing a mantle of gravels on plains now adjoining the Hills at high levels, extending up the valley as benches and passing over many saddle-shaped divides. Leveling and mapping of their features are now in progress by Mr. Darton with a view to determining quantitatively the amounts of uplift at the several periods and their variations from place to place through the Hills.

River Terraces in Southwestern Colorado: By MR. A. C. SPENCER.

The rivers draining the San Juan mountains emerge from deep canyons in palæozoic and older rocks upon a comparatively low-lying region of younger rocks, comprising sandstones and shales. These softer rocks have been easily reduced by erosion and in the vicinity of the rivers terraces have been produced at altitudes up to 500 feet above the present channels.

The highest terraces may be correlated from the Animas River at Durango, westward to the Mancos River and McElmo Creek, and may be recognized in the lower valley of the San Miguel River. Similar terraces upon the Uncompahgre River near Montrose, and along the Gunnison and Grand rivers are also believed to correspond. These facts are taken to indicate the amount of recent erosion which the rivers have accomplished, and as evidence of regional uplift. There were several distinct upward movements, all prior to the glaciation of the San Juan mountains.

Some Coast Migrations in Southern California: By MR. BAILEY WILLIS.

THE 102d meeting was held at the Cosmos Club, May 2, 1900.

The following papers were presented on the regular program:

A Reconnaissance from Pyramid Harbor to Forty-mile River, Alaska: By MR. ALFRED H. BROOKS.

The route followed extends westward from Lynn Canal along the northern front of the St. Elias Range to the head of the White, Tanana and Nabesna rivers. At the Nabesna river it turned northward and, crossing the Tanana, extended on to Eagle City on the Yukon. The chief orographic features are the Coast Range of Lynn Canal which extends westward beyond Lake De Zar Diash, the St. Elias Range which forms the Coast Range westward from Cross Sound, the Nutzotin Mountains, which are a minor range running parallel to the St. Elias near the headwaters of the Tanana and White rivers, the Mentasta Mountains, which are a westward extension of the same range and connect them with the Alaskan Range. From the base of these mountains the Yukon Plateau extends northward, and is a dissected upland sloping gently to the west. The drainage of the region is taken by the Chilkat river to Lynn Canal, by the Alsek southward to the Pacific, and by the Tanana and White rivers which are tributaries of the Yukon. The oldest rocks of the region are the gneisses and crystalline schists forming a broad belt between the

Tanana and the Yukon. The next succeeding formations which overlie the gneisses unconformably are grouped together as the Older Sedimentary Series, and include the gold bearing horizons of the Fortymile region. It is probably of Silurian and pre-Silurian age. A second series of Paleozoic rocks are classed as the Younger Sedimentary Series. These are largely Devonian and Carboniferous as determined by fossil evidence. They include a broad belt which was traced westward from Lynn Canal to the Nabesna river. This younger series is cut by large masses of intrusive rocks. The largest belt of these intrusives is the Coast Range granite which extends westward to the White river.

Along the northern base of the St. Elias Range were found considerable areas of effusive rocks which have often been tilted, forming monoclinal uplifts dipping southward and faulted on the north side. These effusives, together with those of the Mount Wrangell group, are probably both Tertiary and recent. The Pleistocene is represented by sands, silts and gravels. The northern limit of glaciation is traced westward as far as the Nabesna river. During the maximum extension of the Cordilleran ice sheet the White River, Tanana, and Nabesna valleys were occupied by glaciers which extended far north of the general limit of glaciation. The white volcanic ash of the upper White river was traced westward as far as the Fortymile basin. It is plainly an æolian deposit.

The copper deposits are largely placer, and are of native copper. Small veins of native copper were found in dioritic rocks connecting white Carboniferous limestone, and also in the white limestone itself near the contact. The gangue mineral is calcite.

Reconnoissance along the Chandlar and Koyukuk Rivers, Alaska: By Mr. F. C. Schrader.

Geology of the Silver Peak District, Nevada: By Mr. W. W. Turner.

The Silver Peak District lies in western Nevada near the California line. The scenery is typical of the Great Basin; isolated ranges lying between broad valleys, most of which are sinks. In the lowest part of most of the valleys are playas, while between the ridges and the playas are detrital slopes of Pleistocene age, often of vast extent. The configuration of the country is in the main due to differential uplift and subsidence, and the valleys are thus chiefly of orographic origin. Such a series of displacements must have been accompanied by normal faulting, and scarps, originating in this way, are to be seen in the region. In general the main faults trend north and south and east and west.

Subsequent erosion has greatly modified the shapes of the ridges, and partly filled the valleys with detritus.

In Miocene time much of the Silver Peak Range, which attains an elevation of 9500 feet, did not exist. Over a portion of its present site was a broad basin occupied by Lake Esmeralda. The deposits of this lake underlie the valleys and form foothill areas and arch up over the central part of the Silver Peak Range, showing that these mountains are in part late Miocene or post-Miocene origin.

With the exception of certain gneisses of doubtful age the oldest rocks of this district are Lower Cambrian, the Middle Cambrian and Silurian being also represented. All of these paleozoic rocks are rich in fossils. The late Eocene or early Miocene beds of Lake Esmeralda contain an abundance of fossil fish, dicotyledonous and other leaves, silicified wood, and fresh-water mollusks. According to Professor Knowlton the dicotyledonous leaves are repesented by holly, oak, sumach, and bayberry, showing that the climate has undergone a great change since Miocene time. From a well watered region it has become an arid one in which there are no running streams.

Volcanic activity began in this region in early Paleozoic time but after these first rhyolitic flows the volcanic forces appear to have been inactive for a very long period. During and subsequent to the deposition of the lake beds rhyolitic and andesitic eruptions occurred in great volume, followed near the beginning of the Pleistocene by eruptions of pumice and basalt, one crater being clearly of Pleistocene age.

F. L. Ransome,
David White,
Secretaries.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE evening of May 5th, that of the 324th regular meeting, was devoted to a joint meeting of the Chemical Society and Biological Society, the subject for discussion being the 'Chemical and Biological Properties of Protoplasm.' The discussion was introduced by O. Loew, H. N. Stokes, H. J. Webber and A. F. Woods, the first two speakers paying special attention to the chemical side of the question, the others taking the ground that chemical changes alone could not account for the vital phenomena exhibited.

H. J. WEBBER,
Secretary of Joint Meeting.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

THE regular meeting of the Section was held on April 23d. Dr. Livingston Farrand spoke on 'Recent Researches in Central Australia,' calling attention to certain points of particular significance in Messrs. Spencer and Gillen's book, 'The Native Tribes of Central Australia,' which appeared last year. Special emphasis was laid on the suggested origin of the religious side of totemism as indicated in the 'Intichinma' ceremonies of the Arunta tribe, which are directed apparently solely toward the end of increasing the supply of the totem animals and plants of the district, each totem group being charged with the treatment of its own totem object and its multiplication for the benefit of the other members of the tribe. The well-known prohibition against killing and eating the totem seems to hold in this region, but tradition and ceremony point to a time when this was not the case. This economic explanation of the custom is the first satisfactory one yet offered and is plausible for the tribes under discussion even though it may not hold for other parts of the world. The social aspect of totemism with its marriage regulations still remains a problem.

The second paper was presented by Dr. Franz Boas on the subject 'The Eskimos of Cumberland Sound.'

The material on which this paper was based was collected by Captain James Mutch. A full version was given of the myth of the creation of land and sea animals, and a description of the beliefs of the people in regard to souls and in regard to a series of heavens and underground worlds which are the abodes of the deceased. A number of taboos were described, and their explanation as given by the Eskimos was stated. They believe that the transgression of a taboo prescribed after the death of an animal causes the transgression to become fastened to the soul of the animal, which goes down to the mistress of the lower world, where the transgression makes the hands of the deity sore. This enrages her, and she causes famine and misfortunes of all kinds.

CHARLES H. JUDD,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis on the evening of May 7, 1900, the following subjects were presented:

Mr. Charles Espenschied gave an interesting address on modern flour milling, tracing the history of the preparation of grain for human food, the developments since 1865, when it was discovered that 'middlings,' when properly cleaned, could be reground into the best of flour, and the introduction of chilled steel rolls to replace the older millstones, so that to-day a good mill separates practically all of the flour in a grain of wheat in its most perfect form and is almost automatic in operation. It was stated that while larger mills are in operation, the most economical mill in use at the present time is that having a daily capacity of about one thousand barrels of flour.

Dr. H. von Schrenk made some remarks concerning the propagation of fruit trees, particularly the apple, illustrating by a large series of specimens the methods of budding and root-grafting which are used for commercial purposes, and discussing at some length the question of the quality of the root system obtained for the new plant by the various modes of propagation.

Professor F. E. Nipher exhibited some photographic positives on glass, and spoke briefly on the relation between negative and positive in photographic plates, showing that there is a certain relation between intensity of actinic

light acting on the plate during exposure and during development, as a result of which a greatly over-exposed plate may be developed into a positive instead of a negative, by allowing access of a limited quantity of light during development, while a plate which has been very briefly exposed may in the same manner be developed into a positive by a proportionate increase in the light allowed to fall on it during development,—a neutral or zero point, in which the plate is completely fogged, being passed in each instance.

Mr. G. Pauls exhibited a number of beautiful caterpillars, the larvæ of *Euphydryas phaeton*, which does not appear to have been hitherto recorded as occurring in Missouri, although Scudder reports it from adjoining states. The food plant on which these were found was a species of *Gerardia*.

Dr. H. von Schrenk exhibited a burl on a branch of Mississippi scrub pine, caused by a rust fungus, *Peridermium cerebrum*, which was in excellent fruit.

Four persons were elected active members of the Academy.

William Trelease,
Recording Secretary.

TORREY BOTANICAL CLUB.

At the meeting on April 10th, the paper of the evening was by Professor F. E. Lloyd, 'Studies in the genus *Lycopodium*.' Professor Lloyd discussed the distinguishing characters of the North American species, with reference to habit, sporangial leaves and their arrangement, leaf-sections and other modifications. Two new species were recognized in this review of the genus. One group of species is remarkable for greater variation here than in Europe, producing five species here and one there; including here *L. inundatum*, *L. alopecuroides*, etc. The type-specimen of *L. pinnatum* of this group was exhibited. These species develop strong, starchy thickening of the growing end of the stem, toward the close of the season, serving as basis of growth the next spring. Professor Lloyd also restored the long-forgotten species *L. Sitchense*, which has five rows of leaves, but has been confused with the 4-rowed species *L. sabinaefolium*.

Dr. Underwood followed, remarking on the general distribution of *Lycopodium*, about 94 species, or perhaps, properly, about 120; of which 12 are North American; perhaps 21 are peculiar to the Andes, and with them grow many others, which extend into Mexico or Guiana; about 8 are peculiar to Madagascar, 4 to India, etc.; mostly in mountain regions. *L. cernuum* probably encircles the world in the tropics. The local distribution along Atlantic America is peculiar; *L. alopecuroides*, reported from New England, cannot be traced by accessible specimens north of Long Island. The sprawling and arching habit of this species, with spongy interior and caterpillar-like or foxtail like exterior gives it a very peculiar effect. Dr. Underwood also described his discoveries of *L. porophilum*, in Kentucky, Wisconsin, Alabama, etc.

The Secretary raised the question of the distribution of *L. annotinum*. This species is present in the Adirondacks, Catskills and Palisades, and forms compact areas in the Pocono; but has been searched for westward in New York without success.

Dr. Britton spoke of the interest attaching to *L. porophilum* as growing on sandstone rocks. Plants on sandstone rocks which have been attributed to *L. Selago* should be re-examined with this in mind. Still another form on the sandstones of the Shawangunk also deserves further investigation. Miss Sanial reported collecting 5 species in or close to New York City.

Miscellaneous notes followed. Dr. Underwood reported word just received from a club member working in Jamaica who has already collected 200 species.

Dr. Britton referred to a Japanese Witch-hazel flowering April 1st at the Botanical Garden, *Hamamelis arborea*, with thorny, pinkish yellow flowers with dark central eye formed by the claret-colored calyx. It has been cultivated at Kew since 1875.

Dr. MacDougal reported a large number of pictures and documents relating to Dr. John Torrey which are accumulating preparatory to the proposed Torrey Day at the A. A. A. S. meeting, with letters to Torrey from Engelmann, Herbert Spencer, etc.

Edward S. Burgess,
Secretary.

SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

AT the last meeting of the Science Club of the University of Wisconsin, Mr. H. L. Russell favored the club with an exceedingly valuable and timely address on 'Some Recent Investigations relative to Communicable Diseases.' Mr. Russell can speak with authority upon this subject and his expression of opinion regarding the efficiency of methods for preventing the spread of diseases and for eradicating them has an especial interest at this time.

Beginning with a brief synopsis of the state of knowledge concerning the nature and life history of the malarial parasite, Mr. Russell discussed the recent researches as to the relation that mosquitoes hold in the propagation of malaria. The establishment of a definite host in which the sexual propagation of the organism of malaria occurs, and a thorough proof of the rôle that this suctorial insect plays in the dissemination of this disease is one of the most brilliant discoveries in biology in recent years.

The discoveries relating to the bubonic plague were then taken up. After discussion of the etiology of the disease and the method by which it is disseminated, the recent methods of treatment including the preventive and curative treatment were presented. It was pointed out that the United States should with a rigorous quarantine escape the bubonic plague since the period required for the organism of the plague to develop in a patient is less than the time required for vessels to reach our shores from infected oriental ports.

Following this a general discussion of the principles underlying the action of therapeutic and prophylactic treatments of different communicable diseases was given embracing the methods of vaccination that result in the production of active and passive immunity in the body of animals as well as of human beings.

WM. H. HOBBS.

DISCUSSION AND CORRESPONDENCE.

A NATIONAL LIBRARY AND MUSEUM OF THE HISTORY OF CHEMISTRY AND COGNATE ARTS AND SCIENCES.

IT is a matter for rejoicing that not only the principal American universities and various institutes, but also a number of professional colleges, among them those of medicine and pharmacy, have accumulated and are in the possession of more or less comprehensive libraries and museums and that they are aiming at their constant enlargement and completion. Such libraries and museums cannot fail to become more and more potent auxiliaries in the educational and literary objects of these institutions as well as an efficient factor for the advancement of American scholarship and culture.

Most of these libraries are of comparatively recent origin and generally embrace the pertinent scientific and professional literature of modern times but rarely contain any considerable amount of works of past centuries. Such older books are scarcely any longer in the book market and are rarely available except by chance as is particularly the case with works that specially relate to the remoter eras of the history of alchemy, of pharmacy, materia medica, spices, etc. Whoever has had experience in the fascinating study in these domains of historical research will be familiar with the difficulty of finding in any one of the great European libraries an approximately complete collection of the extant literature of all ages. There is quite a difference in this respect among the foremost libraries; they are mostly well provided with the general literature of the past, but are more or less deficient in this special domain of historical records. But in the multiplicity of the great book collections, particularly in Germany, libraries specially rich in ancient works relating to the history of materia medica, alchemy and pharmacy are sometimes located in close proximity and even in one city, like the comprehensive historical libraries of the German National Museum and that of the municipality at Nuremburg, the University and the city libraries at Leipsic and the various great libraries in Berlin, London and Paris. Shortcomings of this kind in the various European libraries are of less consequence to the student as the distances in Central Europe are not considerable and as books are distributed on loan by mail by most libraries.

It is, however, different in a younger civilization, and in a country of so vast an extent as the United States, where the prevailing multi-

plication of libraries, on the one hand, and the increasing scarcity of available books of remoter ages, on the other hand, tend constantly to increase these difficulties. The stock of ancient works in these domains of history is rapidly absorbed by the older standing libraries, and is becoming scarcer and less available from century to century. As these works are of paramount value, and indispensable in historical research and study, it should be the common aim of American scientists interested in the history of applied chemistry, of medicine, pharmacy, and materia medica, to conscientiously gather, preserve and, as much as possible, to unite whatever much or little of such ancient books as has been accumulated in American book collections, with a view of ultimately consolidating the scattered parcels of these literary treasures into one American historical library of chemistry and cognate sciences and arts, instead of leaving them dispersed and screened in a multitude of petty private book collections.

Such a desideratum might be realized by the initiative and joint action of the American Chemical Society, of the American Association for the Advancement of Science, and of the American Pharmaceutical Association, and should be undertaken in time. An excellent and rare chance, perhaps never to become available again is fortunately close at hand. The various university, and other public, libraries may possess some stray volumes of such historical literature, and in the common interest may consent to transfer them to a central historical library of chemical and cognate literature. But the main stock for the foundation of such a library might be obtained, sooner or later, by the acquisition and the consolidation of two collateral historical libraries of superior extent and value, accumulated by individual efforts and means, during many years of unostentatious, patient, and discriminating collecting. They are the comprehensive libraries of Professor H. Carrington Bolton, in Washington, D. C., and of Professor John Uri Lloyd, and Mr. Curtis G. Lloyd, in Cincinnati, O.; the former embracing, especially, the history of alchemy and chemistry, the latter that of materia medica, pharmacy and botany.

By themselves and in the prevailing drift of indiscriminate multiplication of public and private libraries these two choice libraries would, perhaps pass to coming generations as uncommonly valuable yet separate, and fragmentary book collections in a special domain of historical bibliography and would hardly ever attain to a maximum of usefulness. When united and subsequently completed by further additions in the way of purchases, donations and bequests, they will form in the course of years a national historical library of chemistry, and materia medica unequalled in America, and on a par with other kindred achievements of American enterprise and munificence. This would add a potent factor for fostering that 'historical sense' so much appreciated in European civilization and culture and largely needed in the materialistic drift prevailing in our country and time. Nor would American students of the remoter eras of history in these domains of knowledge and application any longer be obliged to resort for historical researches to the libraries of foreign countries.

Another somewhat correlated subject is the collection and preservation of historical articles of all kinds relating to the history of chemistry, pharmacy and materia medica, as well as to objects of remembrance of men eminent in these domains of application. Whoever is familiar with the valuable and interesting historical collections of this kind in the ethnographical and art museums of the European capitals, of the National Museum at Nuremberg, and a number of Continental public and private collections will appreciate their usefulness and significance. How many interesting objects of remembrance of eminent chemists and naturalists of the past are still astray and concealed in family and private custody, perhaps never to be gathered in accessible collections as mementos to coming generations! At the occasion of the annual meeting of the Swiss Pharmaceutical Society at Bern in August, 1898, there was in addition to the customary display of apparatus and implements an exhibit of the miscellaneous objects left by the late Dr. Fred. Flückiger, till 1891 professor of pharmaceutical chemistry and pharmacognosy at the university of Strassburg and one of the foremost scholars and writers in these special domains. It comprised laboratory

apparatus, manuscripts, rare books, diplomas medals and various other objects of historical interest and demonstrated impressively the value and usefulness of collections of this kind.

Throughout the United States there is undoubtedly scattered a large number of similar objects and specimens of paramount historical interest and significance left by departed naturalists and students, partly emigrants from European and Central American States, which after the demise of their owners have passed to succeeding generations, perhaps as little understood and appreciated, obsolete relics. Most of such articles, even of more recent American investigators and scholars sooner or later sink into oblivion and frequently are lost. When gathered by purchase, donation or bequest and collected and preserved in one museum they would form a comprehensive collection, valuable and instructive for the history of chemistry and pharmacy as well as of their foremost representative men of the past.

Some such stray relics are to be found in a number of the collections of American institutes and universities, among them in the materia medica collection of the National Museum at Washington. They are the few remaining implements of Joseph Priestley from his kitchen laboratory in Northumberland, Pa., which will be remembered by the surviving American chemists who on August 1, 1874, assembled at that secluded village in the beautiful Susquehanna valley in centennial commemoration of the discovery of oxygen. Many interesting objects from the laboratories and studies, as well as an abundance of documents consisting of books, diplomas, medals, manuscripts, correspondence of American chemists and naturalists of the departing century, now scattered and concealed on the shelves of college museums and in domestic shrines, when gathered and united in a national museum, would at once and still more in time form a memorable and most valuable and interesting collection to which the older generation of still living American chemists and scientists would not fail sooner or later to contribute their share.

In this way an historical library and museum of chemistry and cognate sciences and arts could be realized in the course of time which from the start would bear the impress of a national one and which in interest and value might soon surpass the existing corresponding European libraries and museums.

These random suggestions may be in place and in time at the dawn of a new century. They may also serve as a timely warning to all interested in this matter against dispersing the historical literary treasures and relics of the past and against the untoward multiplication of petty and inadequate historical libraries and collections as met with in the old and not less in the new world.

FRED. HOFFMANN.

BERLIN, April, 1900.

CEDAR COLLARS OF THE NORTH PACIFIC COAST INDIANS.

EDITOR OF SCIENCE: Can any one tell me whether the cedar collars of the North Pacific Coast Indians are made rights and lefts. In Dr. Boas's paper in Report of U. S. National Museum for 1895, on the Kwakiutl Indians there are many examples of the cedar bark collars figured, but it does not appear from the drawings whether they are worn indifferently on the right or left shoulder, that is, whether the ornament is worn on a particular side. The reason for asking is this: The Porto Rican stone collars are rights and lefts. In the National Museum collection of thirty, every one of them is carefully carved to imitate the splice joint shown perfectly in Dr. Boas's examples of cedar bark. In the drama of the expulsion of the Cannibal, acted with so much spirit by these Indians in Chicago, two men led the Cannibal to the fire, each wearing a cedar bark collar. It requires little imagination to transfer this scene to Porto Rico, where stone collars in likeness of those of bark would surround the necks of the captors, one on the right hand, the other on the left, wearing each the decoration outside. I discovered twenty-five years ago that the Porto Rican collars were rights and lefts, also that the overlapping ornament at the side of each stood for the sizing or wrapping of a hoop, but then did not know that Dr. Boas's Kwakuitl Indians were wearing homologous decorations.

O. T. MASON.

HIGHHOLE COURTSHIP AGAIN.

To the Editor of Science: On one of the last days of April I noticed a pair of highholes on the turf about forty feet away. One would drill the turf vigorously a few times, and then nod the beak repeatedly with a sidewise motion to the other—presumably the female, and this one took no part in the turf-drilling. While nothing passed from beak to beak, yet the antic play rather confirmed my somewhat jesting suggestion (Science, N. S., 1897, 921) that it is a feeding pantomine, the female, like a young bird, being receptive of the feeding attentions of the mate. A thorough study of this interesting bird through a telescope or powerful glass ought to reward the observer.

Hiram M. Stanley.

Lake Forest, Ill.,
May 7, 1900.

A CORRECTION.

In a note printed on page 753 of Science (May 11th), I inadvertently appear to advocate the view that the current year belongs to the twentieth century, which is not my opinion. The sentence in question should have read "It seems to me that that is reason enough why we should use '00 always to mean 1800, not 1900, even though the current year belongs to the *nineteenth* century."

E. L. Mark.

THE GRAPHOPHONE AS AN AUXILIARY ASTRONOMICAL INSTRUMENT. A SUGGESTION.

In order to insure as comprehensive and authentic a graphic record of the appearance of the solar corona, as deliberate and close observation and scrutiny limited to the few minutes of totality can well be expected to furnish, I beg leave to suggest the employment of an ordinary graphophone for taking down the observer's talk instead of a short-hand recorder.

The graphophone if properly set agoing and manipulated will easily record all the observer might choose to say for about three or four minutes, and therefore would enable him to give his undivided attention to the examination and thorough study of the aspect of the phenomenon, without even the risk of being disturbed or interrupted at the critical moments by questions, etc. Nothing, it would seem, could possibly defeat securing by this means a complete and authentic record of all an observer might feel prompted to utter or note, except, perhaps in the case the splendor of the corona should render him temporarily speechless. For verification, if deemed necessary, employ a second graphophone. The time of occurrence of any unexpected event can be noted and recorded upon the rotating barrel in several ways.

A trustworthy and comprehensive graphic account of the physical aspect of the corona and chromosphere, would be valuable I should think, in so far as it would supplement the colorless work of the camera.

W. E.

NOTES ON PHYSICS.

THE BLUE HILL KITE OBSERVATIONS.

Mr. H. H. Clayton, in an interesting letter to *Nature*, April 26th, points out the bearing of recent observations of temperature and wind velocities at high altitudes upon the theories of cyclonic movements of the atmosphere. Four types of instability of the atmosphere are now recognized: (1) Instability due to heating of the lower strata of the atmosphere (vertical temperature gradient). (2) Instability due to the thrusting of large masses of warm air into cool regions or of large masses of cold air into warm regions, for example, a long continued southerly wind carries a mass of warm air northward into a region in which the surrounding air is cool (horizontal temperature gradient). (3) Instability due to accumulation of water vapor in the lower strata of the air. Such air precipitates its moisture more and more as it rises, is warmed by this precipitation and rushes upwards with increasing violence. (4) Instability of air streams which have passed beyond the region in which they are more or less of the nature of permanent states of motion. Thus the trade and antitrade winds in certain regions show the characteristics of what are called in hydrodynamics *permanent states of motion* and when they pass beyond these regions they become dynamically unstable and break up.

Each of these various types of atmospheric instability has been put forth as the principal cause of cyclonic motion by different writers

and Mr. Clayton points out that observations in the high regions of the atmosphere afford criteria for determining which of the four types of instability is most predominant in a cyclone.

The kite observations at Blue Hill seem to show according to Mr. Clayton that the first type of instability is not all important, but it must be remembered that these kite observations do not extend beyond 3000 meters above sea level, and although Mr. Clayton considers also the balloon observations which have been made in Europe, still we think that his conclusion is more or less tentative (as no doubt Mr. Clayton intends it to be) but he seems to lose sight of the fact that the vertical stability theory, No. 1, requires a high pressure area in the higher regions to be directly above a low pressure area at the earth's surface. Thus Mr. Clayton seems to think that the observations of March 24, 1899, showing a low pressure area near the earth's surface in Italy and a low pressure area in the upper air over Finland, is against the vertical instability theory. Further, after a cyclone has been some time under way the upward current near the center of the cyclone would undoubtedly produce a mass of warm air extending to enormous altitudes immediately above the center and that, therefore, the absence of a cold stratum within the range of the observations is not decisively against the vertical instability theory.

Furthermore, the force of Dr. Hann's objection to the preponderating influence of the third type of instability, that cyclones are more frequent and more violent in winter than in summer, is weakened by the fact that our position with reference to the polar and equatorial winds is very different in winter than it is in summer so that the influence of the fourth type of instability is greatly different at these two seasons and may mask the effect of the third type.

The probability is that one type of instability may preponderate in one place or one season and another type in another place or season.

The present writer is inclined to think that as a rule, the first type of instability furnishes the energy of cyclonic movement and that the fourth type determines the line of progress or the path of the cyclone; that the second type of instability is the cause of the local disturbances which occur in the region just ahead of a cyclone such as tornadoes and thunder storms; and that the third type of instability contributes greatly to the violence of these local disturbances.

W. S. F.

APPLIED SCIENCE IN MUNICIPAL WORK.

THE city of Marshalltown, Iowa, has just issued in pamphlet form, the 'preliminary data for the design of a proposed sewage system' which illustrates in an unusually satisfactory manner, the rare case in which municipal authorities have displayed enough of wisdom and of familiarity with the resources of their country to bring to bear upon their problems of construction, the best scientific knowledge available. The committee of the city council applied to Professor Marston, the civil engineer, Professor Weems, the chemist and Professor Pammel, the botanist of the University of Iowa, for advice, and under their direction the data reported were collected. The work of the survey in detail, was done by trained students, largely, and the drawings were made by Miss Wilson. The city of Marshalltown paid all expenses and its officials seem to have heartily seconded the endeavor of the chemists and engineers of the University.

The city has a population of 12,000 and is the county seat of Marshall Co., and the commercial center of a rich agricultural country. There is some manufacturing, the principal shops of the Iowa Central Railroad and large beet-sugar manufacturing establishments being located there. The sewer system contains about ten miles of sewers and laterals. Water is supplied from drive-wells and to the amount of about 1,300,000 gallons per day, the glucose and packing houses taking a large fraction of that used for other than domestic purposes. It contains about 300 parts solid matter in the million, mainly lime and magnesia salts. Deeper wells of artesian character, belonging to the glucose company, show about 900 parts solid matter, of which about two-thirds seem to be lime and magnesia salts and fifteen per cent. organic matter, although the wells are 300 feet in depth. The city water in May, 1899,

showed 1040 bacteria per c.c. The sewage is passed into the Iowa River, which flows, at a minimum, about 3,250,000 gallons per twenty-four hours and contamination by sewage is at all times serious. Where thus contaminated, its color is dark, its odor offensive and its mean content of bacteria at times as high as about 100,000 per c.c. and probably more. The outcome of litigation directed against the city by residents of the country below, along the banks of the stream, has been the determination of the city to adopt a system of purification of the sewage and it is to this end that the experts of the University were consulted.

It was promptly discovered that the glucose sewage was very different from that of the city, in respect to content of bacteria, as was to have been expected. Its bacteria ranged up to, in one case, nearly ten millions per c.c. While not unwholesome when fresh, it is subject to putrefaction of a seriously objectionable character. The packing-house sewage also contains large quantities of bacteria and has a characteristic composition. The result of intermixture of these various kinds of sewage is a peculiarly offensive and troublesome compound.

In seeking the best remedy for this state of affairs at Marshalltown, the data printed in the report were gathered. The work included a study of the topography of the country, of the character of the soil, the available materials for construction, of filtering and settling tanks and the costs of labor and material. It is stated that the works should be completed before November of the present year.

In the performance of the work of the consulting chemists and bacteriologists, the methods of the Massachusetts Board of Health were usually followed.

R. H. Thurston.

'ARROWPOINTS, SPEARHEADS AND KNIVES OF PREHISTORIC TIMES.'

Under the above title, Professor Thomas Wilson, Curator of the Division of Prehistoric Archæology of the U. S. National Museum, occupies pages 811 to 988, of the Report of the Museum for 1897. Sixty-five plates and two hundred and one text figures accompany the paper. The whole is also run by the Government Printing Office, as a reprint bearing the date 1899.

Much material is brought together in this paper, besides copious references to the literature and sources of information. The chipped objects of the palæolithic period are touched upon, and sections are devoted to the origin, invention and evolution of the bow and arrow; superstitions concerning arrowpoints; flint mines and quarries of Europe and America; caches; material for points and its microscopic examination; the manufacture of points; and scrapers, grinders and straightners used in making shafts for arrows and spears. Fifty-seven pages and a proportional number of plates and figures are devoted to Mr. Wilson's classification of points for arrows and spears which is under the four main divisions, leaf-shaped, triangular, stemmed and peculiar forms. Knives and wounds made by points are also discussed. Flint mines and quarries, caches, large implements and the making of arrowpoints described by explorers and travelers are the subjects included in appendices A, B, C and D.

Some of the illustrations are familiar to readers of archæologic literature, who are glad to have them brought, together with the new illustrations, under one cover.

The manufacture of arrowpoints was seen as late as the summer of 1898 by several members of the Jesup North Pacific Expedition in the Thompson Valley, British Columbia, but in a few years it will be an industry of the past, at least in regions accessible to the body of students of archæology. Dr. Wilson has introduced a number of quaint pictures of a flint knapper engaged in chipping gun flints at Brandon, Suffolk, England.

Harlan I. Smith.

DIETARY STUDIES OF UNIVERSITY BOAT CREWS.

Professor W. O. Atwater and Mr. A. P. Bryant have prepared an interesting bulletin on the above subject, published through the Office of Experiment Stations, U. S. Department of Agriculture. Their results, together with the comparison of other dietary studies, are summarized in the following table:

TABLE SHOWING NUTRIMENTS IN FOOD ACTUALLY EATEN PER MAN PER DAY.

	Protein.	Fat.	Carbo-hydrates.	Fuel value.
DIETARY STUDIES OF UNIVERSITY BOAT CREWS.				
	Grams.	*Grams.*	*Grams.*	*Calories.*
Harvard University crew at Cambridge (No. 227)	162	175	449	4,130
Harvard Freshman crew at Cambridge (No. 228)	153	223	468	4,620
Yale University crew at New Haven (No. 229)	145	170	375	3,705
Harvard University crew at Gales Ferry (No. 230)	160	170	448	4,075
Harvard Freshman crew at Gales Ferry (No. 231)	135	152	416	3,675
Yale University crew at Gales Ferry (No. 232)	171	171	434	4,070
Captain of Harvard Freshman crew (No. 233)	155	181	487	4,315
Average	155	177	440	4,085
SUMMARIZED RESULTS OF OTHER DIETARY STUDIES.				
Football team, college students, Connecticut	181	292	557	5,740
Football team, college students, California	270	416	710	7,885
Professional athlete, Sandow	244	151	502	4,460
Prize fighter, England	278	78	83	2,205
Average of 15 college clubs	107	148	459	3,690
Average of 14 mechanics' families	103	150	402	3,465
Average of 10 farmers' families	97	130	467	3,515
Average of 24 mechanics' and farmers' families	100	141	429	3,480
Average of 14 professional men's families	104	125	423	3,325
DIETARY STANDARDS.				
Man with moderate muscular work, Voit	118	56	500	3,055
Man with moderate muscular work, Playfair	119	51	531	3,140
Man with moderate muscular work, Atwater	125	.....	.....	3,500
Man with hard muscular work, Voit	145	100	450	3,370
Man with hard muscular work, Playfair	156	71	568	3,630
Man with hard muscular work, Atwater	150	.....	.....	4,500
Man with severe muscular work, Playfair	185	71	568	3,750
Man with severe muscular work, Atwater	175	.....	.....	5,700

LAKE LABORATORY OF THE OHIO STATE UNIVERSITY.

THE Lake Laboratory of the Ohio State University was established under the direction of the late Professor D. S. Kellicott, for the especial purpose of providing opportunity for investigation of the biology of the lake region, and investigations have been carried on each summer since its establishment except for the summer of 1898, when the death of Professor Kellicott interrupted the work. It has now been determined to add to the original purpose the provision for giving certain courses of instruction and to combine work of the departments of botany and zoology. The following statements concerning the plans for the summer of 1900 are made for the benefit of those who may wish to work at the laboratory, either in independent investigations or in connection with the courses of instruction offered.

The staff includes the regular instructors in the departments of Botany, Zoology and Entomology.

HERBERT OSBORN, Professor of Zoology and Entomology, *Director*.

W. A. KELLERMAN, Professor of Botany.

JAMES S. HINE, Assistant Professor of Entomology.

J. H. SCHAFFNER, Assistant Professor of Botany.

F. L. LANDACRE, Assistant in Zoology.

The laboratory is located close to the waters of Sandusky Bay, which teem with animal and plant life, while extensive marshes, the river, native forest, beach and lake are all within easy reach. Put-in-Bay with the United States Fish Hatchery, Kelley's Island with its glacial grooves, and other points of natural interest are easily reached by excursions and will be visited in collecting or special trips. The fishing industry centering at Sandusky, affords special opportunity for study and investigation in ichthyology.

The laboratory is housed in the former State Hatchery building which has been arranged with tables, dark room, aquaria, etc., and is supplied with microscopes and other apparatus from the university. Boats, collecting apparatus, dredges, seines, etc., are well supplied and special attention will be given to the methods of collecting and field work.

The courses of instruction will open July 2d, and run eight weeks. Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

Following the plan which has been in operation for several years past, the laboratory will be open to properly qualified persons who may desire to engage in investigations of biological problems pertaining to the life of the locality. No fees will be charged and table room, use of ordinary reagents, boats, aquaria, etc., will be supplied, subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

The laboratory will be open for investigators from June 15th to September 15th. Applications for table room should be made as early as possible with indication of the time during which space will be desired.

SCIENTIFIC NOTES AND NEWS.

THE bill for the establishment of a government biological station on the coast of North Carolina has become a law. The sum of $12,500 is appropriated for the construction and equipment of the station, which, it is understood, will be located on Beaufort Harbor.

THE Senate Committee has made a report on the Nicaragua Canal bill, favoring the provision by Congress of money to construct the canal after having secured authority from Nicaragua. The proposition to buy the works by the French on the Panama route was rejected.

THE House Committee has submitted a favorable report on the measure now before Congress designed to prevent the adulteration, misbranding and imitation of foods and drugs. The bill would create a chemical bureau under the U. S. Department of Agriculture.

A COMPLIMENTARY dinner was given on May 15th to Professor Wilder D. Bancroft, of Cornell University, by his associates and pupils in the department of physical chemistry. The occasion was the fifth anniversary of the inauguration of the department. Speeches were made by Professor E. L. Nichols, Professor J. E. Trevor, and others; and many messages of congratulation were received from friends and old associates of Professor Bancroft in other universities.

PROFESSOR C. A. YOUNG, director of the Halsted Observatory, Princeton University, will give a commencement oration at Western Reserve University. Professor Young was professor at Western Reserve University before going to Dartmouth and Princeton. During the commencement there is to be an informal opening of the new telescope, which has been given to the university by Mrs. W. R. Warner and Ambrose Swasey, of Cleveland.

DR. EDUARDO WILDE, the new minister to the United States from Argentina, was formerly minister of Public Instruction and is known for his studies in yellow fever.

MR. W. E. D. SCOTT, curator of the ornithological collections of Princeton University, has returned from a visit abroad where he has been studying the ornithological collections in London and Paris with a view to his monograph on the Patagonian birds collected by Mr. J. B. Hatcher.

A DINNER was given in London on April 28th to Sir W. MacCormac and Mr. Trevors to celebrate the occasion of their return from South Africa.

JAMES M. CONSTABLE, Vice-President of the American Museum of Natural History, died on May 12th, at the age of eighty-eight. Mr. Constable was born at Stonington, Sussex, England, but came to New York in 1836.

THE death is announced at the age of 77 years of Professor Wenzel Hecke, formerly a

member of the faculty of the School of Agriculture, at Vienna, and of Dr. Bernhart Nöldeke. assistant in the zoological laboratory of the University of Strassburg.

LIEUTENANT-GENERAL A. H. LANE-FOX PITT-RIVERS, F.R.S., died on May 4th, at the age of 73 years. He had a distinguished military career, but was best known for his work in anthropology and archæology. The London *Times* states that he was only 25 when he began to collect specimens of objects such as weapons, articles of dress, ornament, etc., which were brought to England from various savage countries. In choosing his specimens he was guided by the principle of connection in form, his desire being to illustrate the development of specific ideas among savage peoples and their transmission from one people to another. The result of his patience and scientific enthusiasm was the formation of a collection illustrative of savage life and embryo civilization which is certainly unrivalled in England and probably in Europe also. It was exhibited in 1874 and 1875, in the Bethnal-green Museum, and afterwards General Pitt-Rivers presented it to the University of Oxford, which gave it a home in the new Museum-buildings, opposite Keble College. In 1880 the General, who had up to that time borne his father's name of Lane-Fox, succeeded to the Rivers estates under the will of his great-uncle, the last Lord Rivers, by which also it was provided that he should assume the name and arms of Pitt-Rivers. From the point of view of the interests of science it would have been difficult to find a better heir for these unique estates. Lying in Wiltshire, near the Dorset border, they had remained, for the most part forest land, containing numerous herds of fallow deer, practically untouched until the present century. They thus presented an unique field for excavation under trained archæological guidance, and General Pitt-Rivers made full use of the opportunity which fortune had placed in his hands. His excavations in the barrows, etc., round Rushmore were extensive and continuous, and the results of them he described in several large volumes which are constantly cited by archæologists. He has contributed a good deal of valuable material to the 'Reports' of the British Association and to the *Journal* of the Anthropological Institute, of which body he was president. At the Oxford Encænia of 1886 he received the honorary degree of D.C.L.

DR. FRITZ SHOTTKY, professor of mathematics at Marburg, has been elected a member of the Academy of Sciences of Berlin.

THE Academy of Sciences of Madrid has awarded its mathematical prizes to G. Loria of Genoa, and F. G. Teixeira of Oporto.

DR. KARL E. GUTHE of the department of physics of the University of Michigan, sailed on May 17th for Europe, where he will spend the summer in special study of the coherer and of polarization. He will read a paper on 'The Theory of the Coherer' at the meeting of the International Congress of Physicists in Paris August 6–11th.

MR. H. F. SILL of the chemical department of Princeton University, has been given leave of absence for two years and will study at Heidelberg and Munich.

WE learn from *Nature* that a committee composed of many eminent men of science in France has been formed for the purpose of obtaining funds for the erection of a modest monument at Langres in honor of Auguste Laurent, the renowned chemist. Laurent was born at La Folie, near Langres, in 1808, and in 1831 became assistant to Dumas under whom he acquired a special knowledge of organic chemistry, and carried on his original researches on naphthalene and carbolic acid, together with their derivatives. After filling various posts, the last of which was a chemical professorship at Bordeaux, Laurent became Warden of the Mint at Paris, where he remained in intimate connection with Gerhardt until his death in 1853. Subscriptions for the proposed monument should be sent to the treasurer of the Committee, M. Caublot, 45 rue de Belleville, Paris.

THE German Society for Advancing the Teaching of Mathematics and the Sciences meets this year at Hamburg from June 4th to 7th.

THE Society of Zoology and Botany at Vienna proposes to celebrate the fiftieth anniversary of its foundation in April, 1901, and to prepare

for the occasion a *Festschrift* setting forth the history of the Society and in general the part played by the natural sciences in the advances of the past fifty years.

In 1833 General Arakezeyew bequeathed to the Russian Academy of Sciences the sum of 50,000 roubles which were to accumulate till 1925, when three-fourths of the sum should be given to the best history in Russian of Alexander I.'s reign. The other quarter was to be spent in printing the work, in having it translated into French and German, and for a prize to the second best work. It is said that the fund now amounts to 1,500,000 roubles and would in 1925 consequently be in the neighborhood of $1,500,000.

At a meeting of the members of the Royal Institution on May 7th, thanks were given to Professor F. Clowes for his donation of £20 to the fund for the promotion of experimental research at low temperatures. The following vice-presidents for the ensuing year were announced from the chair: Sir F. Bramwell, Lord Lister, Dr. Ludwig Mond, Sir A. Noble, Mr. A. Siemens, the Hon. Sir J. Stirling, Sir J. Crichton Browne, treasurer, and Sir W. Crookes, honorary secretary.

A society at Gera, Germany, offers prizes for essays calling attention to the need of protection of plants by the young. It is proposed to circulate the essays widely through the schools.

The University of Zurich offers a prize for an essay on the use of alcohol in acute diseases.

Sigmi Xi, the Scientific Society corresponding to Phi Beta Kappa, has established a chapter at Brown University with Professor B. F. Clarke as president.

Under the direction of Captain J. F. Pratt, of the United States Coast and Geodetic Survey, preparations are being made to despatch the United States steamers *Pathfinder* and *Patterson* to Behring Sea early next month, where they will be engaged during the season in surveying the coast of Alaska between St. Michael and Cape Prince of Wales.

Professor Linck, director of the mineralogical laboratory at Jena has undertaken a scientific expedition to the Soudan.

Reuter's Agency learns that Dr. Louis Sambon and Dr. G. C. Low, who, as we have already reported, are about to experiment with a view to proving that malaria is spread by mosquito bites, expect to begin work seriously on June 1st, by which time they would have all their arrangements completed. They were leaving London immediately. They had hit upon a suitable spot in the Campagna, on the line of the railway running from Rome to Tivoli, and there they would begin their work. Their house would be put together at a spot about a mile from the little station of Cervellata, 30 minutes' run by rail from Rome, where a colony of Lombards were trying to reclaim that part of the Campagna. So far as malarial conditions were concerned no place could be worse.

The New York *Evening Post* contains the following note: "Commander Chapman C. Todd, chief hydrographer of the Navy, has been suspended from duty by Secretary Long, pending an investigation by the department into a charge that he had endeavored to influence the action of Congress in a matter affecting the naval service. The suspension grew out of the controversy in Congress over the reduction by the House Committee on Appropriations of the appropriation for surveys to be conducted by the Navy, and the refusal of the committee to agree to turn over the surveys of the insular possessions of the United States to the naval service. Commander Todd is one of the best known officers of the Navy. He commanded the gun-boat Wilmington in the Spanish-American war, and was in charge of the operations at Cardenas in May, 1898, in which Ensign Worth Bagley and some enlisted men of the torpedo boat Winslow were killed. After the war he made a cruise in the Wilmington up the Amazon River, penetrating to regions where no foreign vessel had ever been."

A telegram was received at the Harvard College Observatory, on May 14th, from the Arequipa station of this Observatory, stating that the correction of the ephemeris of Eros. computed by Mr. Daniel N. Jones, Jr., is zero, In the Bulletin issued on April 29th, and published in this Journal, it will be noticed that the correction to this ephemeris is almost exactly

half the diurnal motion of Eros. Professor Kreutz accordingly cabled that so large a correction seemed improbable and that perhaps an error of twelve hours had been made. A cablegram was accordingly sent to Arequipa and in a few hours a reply was received stating that the correction was zero. The error perhaps arose from assuming that the ephemeris was computed for noon instead of midnight. Attempts were made both visually and photographically to verify this conclusion, but without success, owing to the proximity of the sun.

THE orange groves of southern Florida have enjoyed favorable conditions during the past winter and are expected to supply about one million boxes. Should there be no frost next winter the groves will be again in good condition and the abundant supply of oranges of ten years ago may be expected.

THE annual banquet of the Royal Academy, London, took place on May 5th, with the president, Sir E. J. Poynter, in the chair, and as usual on such occasions the company included many of the most distinguished Englishmen. Sir Norman Lockyer replied to the toast on behalf of science and said, according to the report of the London *Times:* It is a very great honor for a student of science to be called upon in such an august assembly as this to say a few words; but if I am to be accepted as the representative of science I do not wish to be fettered by your suggestion, Sir, that I should refer to the dependence of art on science. I am sure that I may frankly say for every man of science that we acknowledge freely the firm brotherhood between art and science—a brotherhood founded upon a common object, the study of Nature, 'the mistress of the masters,' and carried on by a common method, the proper coordination of brain, hand and eye. In every case which a man of science or a man of art has to tackle imagination is required, and so science and art meet upon terms of mutual helpfulness. I think I may also say that this feeling is thoroughly reciprocated by men of art, for many of them honor me with their friendship, and therefore I know their sentiments. I am the more anxious to say this because some twenty years ago, when I was privileged to attend this anniversary dinner, I heard a distinguished representative of literature express a totally different sentiment. He told me that 'before their sister, Science, now so full of promise and pride, was born, there were Art and Literature like twins together,' and it was suggested that the sooner art and literature formed an alliance offensive and defensive against the interloper the better it would be for them. I do not believe in this. For me science is as old as art. They have both advanced together. Let us take the position of things 6000 years ago—to begin at the beginning of things, if we can. Then the priest-mummifiers of Memphis had to be profound anatomists. If you go to the Gizeh Museum you find magnificent specimens in those statues of Chepren in diorite, other statues in wood, and the plaques, veritable Memlings in stone. If you come down to a comparatively modern period, something like 600 B. C., and compare those wonderful metopes of Solinunto with the marbles of the Parthenon, which are of a later date, you will find an enormous advance in the latter. You will find that Hippocrates had lived in the interval. And, carrying the matter down to the introduction of the University system in Northern Italy in the 13th century, we find that the difference between the art of Cimabue and Giotto depends on the fact that anatomy had been introduced in the meantime. Science, then, is no new interloper seeking to detract from the importance of art and literature. What was new 20 years ago was that the work of the late Prince Consort, whose name will always be revered by those who know the benefits he conferred on our country was then beginning to tell. He showed us that in order to secure individual progress we must have a combination of science and art both in teaching and manufacture. Being well assured of the valor and endurance of our soldiers and sailors in war, the chief thing we have to do is to see that they are properly supplied with the engines and munitions of war. For the beauty of a nation's life and a perfect record of it we must look chiefly to the sweetening and ennobling influences of art and the enduring works of its masters; but for a nation's continued welfare and progress both science and art are

necessary. We are in face of industrial struggles, and we must utilize both science and art to supply the wants of our own and other countries, and to provide commodities made in England, besides handling

> "Things of beauty, things of use,
> That one fair planet can produce,
> Brought from under every star."

We are in face of a struggle for existence in which we know full well that only the fittest will survive. How are we going to carry on the struggle? What are our weapons? Our first line of defence in this direction can only consist of our universities and our teaching centers. Have we enough of them? We know already that we have not enough of them, because we have already lost several important engagements in these industrial battles. Are there no means by which we can judge of their sufficiency? In those less peaceful struggles among nations which must sometimes arise we have a first line of defence of another kind—our Navy. In that case we have the well-understood and generally acknowledged principle that our fleet must be equal to the fleets of any two other possibly contending nations. This principle, I think, should be applied to our first line of defence in these industrial conflicts the results of which are more enduring. Do our teaching and research centers at present outnumber in the same proportion, as do our ships, those of any two nations which are actually contending with us in peaceful enterprise? And, also, are they equally efficient in every respect? I believe, and I know that this view is held by many representative men of science, that until our universities, our science schools, our art schools, and our technical institutions bear the same relation both in number and efficiency to those of other nations as do our battleships, cruisers, and small craft, we shall not be justified in regarding the future of the empire with that freedom from care which is the attribute of a strong man armed.

UNIVERSITY AND EDUCATIONAL NEWS.

Mr. James Milliken of Decatur, Ill., has offered $200,000 and land for the establishment of a college under the auspices of the Cumberland Presbyterian Church of that place. It is said that the citizens will give over $100,000 toward the college.

New York University has received $20,000 and Rutgers College $10,000 by the will of the late Robert Schell of New York.

A scholarship in New York University has been endowed with $2500 by Dean and Mrs. Edward R. Shaw in memory of their son, a member of the class of 1900, who died last year.

The Ohio Institute of Mining Engineers has undertaken to defray the cost of a scholarship of $100 annually at the School of Mines of the Ohio State University.

The first meeting of the Court of Governors of the Birmingham University was convened for the 31st inst. The donations to the endowment fund which have already been promised amount to $327,000.

At Harvard University Dr. R. DeC. Ward has been promoted to an assistant professorship of climatology, and Mr. W. C. Sabine to an assistant professorship of physics.

The following promotions have been made in the Philosophical Department of the University of Michigan: Mr. George Rebec, Ph.D. (Michigan), instructor in philosophy, to be assistant professor of philosophy; Mr. W. B. Pillsbury, Ph.D. (Cornell), instructor in psychology, to be assistant professor of philosophy and director of the psychological laboratory.

George H. Ling, now instructor of mathematics at Wesleyan University, has been appointed a professor at the Cincinnati University.

Professor Pierre de Peyster Ricketts has resigned from the chair of analytical chemistry of Columbia University.

Dr. August Töpler, professor of physics at the Technical Institute of Dresden, will retire on the first of October.

Dr. Franz Kossmat, assistant in the Austrian Geological Survey, has qualified as docent in the University of Vienna, and Dr. Paul Ehrenreich as docent in ethnology at Berlin.

Dr. Arthur Wreschner has qualified as docent for philosophy and psychology at Zurich. The subject of his inaugural address was 'The Influence of Leibnitz on pre-Kantian Psychology and Æsthetics.'